A HITCHCOCK PUBLICATION

Grinding and Finishing

APRIL 1961 • 50 CENTS

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TECHNOLOGY DEPARTMENT

Basic rules for efficient cutter harpening

also in this issue:

Seal Leakage Improved by Blasting
Standard Wheel Markings—Grade
Diamonds Grind Sapphire and Quartz

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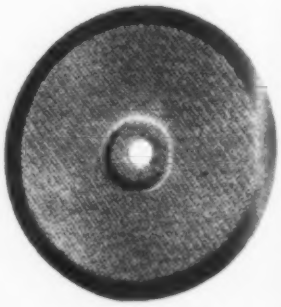
Whether you want fast stock removal or a micro-inch finish, for tool and cutter grinding, carbide grinding, for cutting-off, or snagging, for surface or disc grinding, for cylindrical or centerless grinding, you get efficiency and savings with Macklin "Wheels of Profit".

That's because uniformity is built into every wheel in Macklin's complete line. You get precise balance, cool and free cutting, and longer wheel life with a Macklin wheel that's "Custom-Engineered" for the job.

If you're having production problems on present applications, new setups, or your quality control, consult a Macklin abrasive engineer about a demonstration in your plant. You can contact him through your Macklin Distributor or call us direct. You'll find this a most effective way to improve your grinding production, and your call or letter will bring prompt response.



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MACKLIN company

DEPARTMENT 63 JACKSON, MICHIGAN

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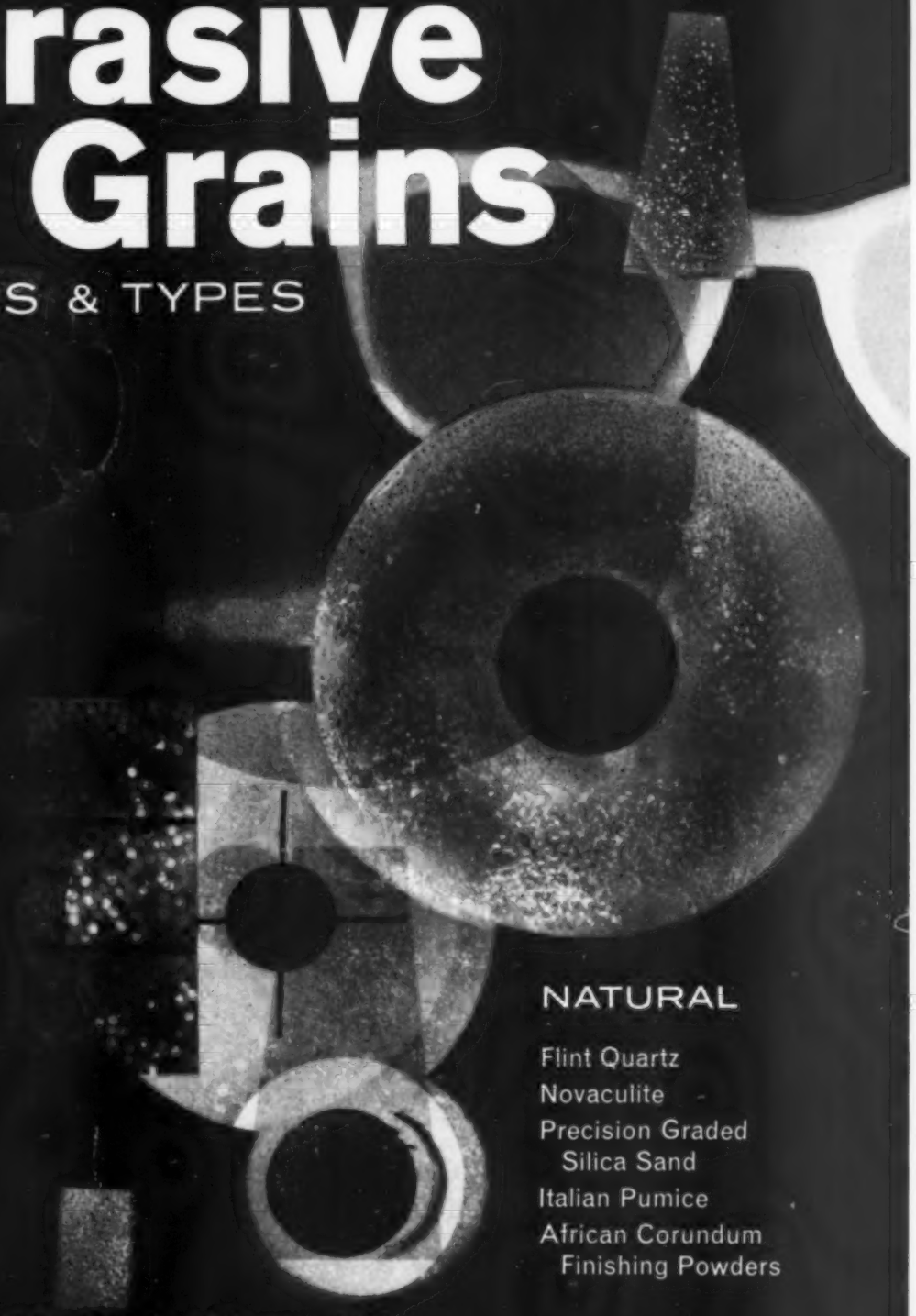

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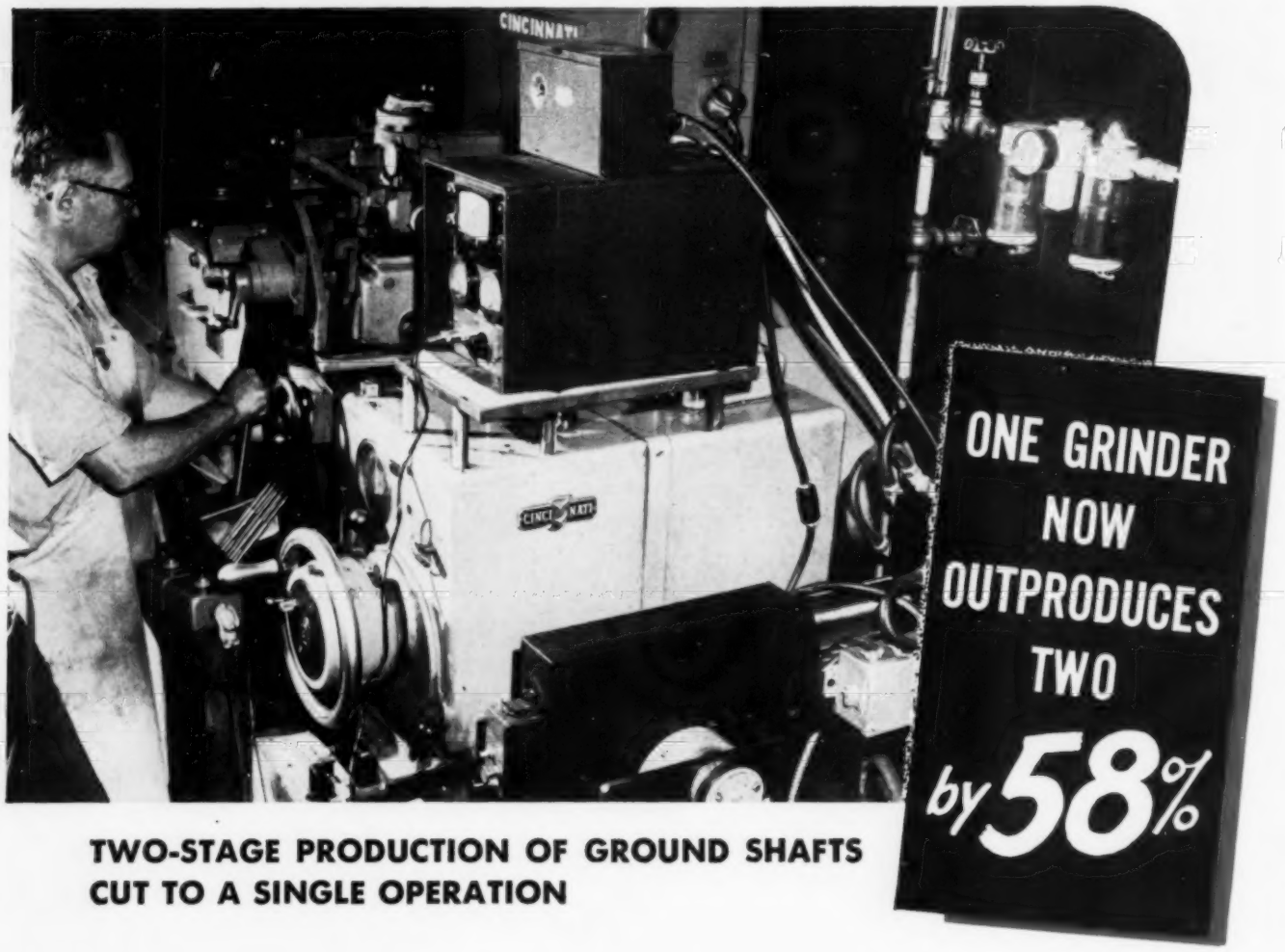

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- **Work held to .0002" in production quantities . . . to .000070" on parts smaller than ½".**
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- **Pre-grinding is eliminated — variations in sizes of workpieces do not affect finished size.**
- **One knob adjusts for size during operation.**
- **Compensation can be made for wheel wear, variations in machine elements and operating conditions without shutting down.**
- **Can be set for both coarse and fine feeds.**
- **Can be set for either continuous cycling or single cycle operation.**

850-C

IT COSTS YOU NOTHING TO INVESTIGATE

Find out how you can cut your grinding costs with the Bel-Air Power Feed. Write today for complete information — no cost or obligation, of course. Address Dept. GF-461, Bellows-Valvair, Akron 9, Ohio.

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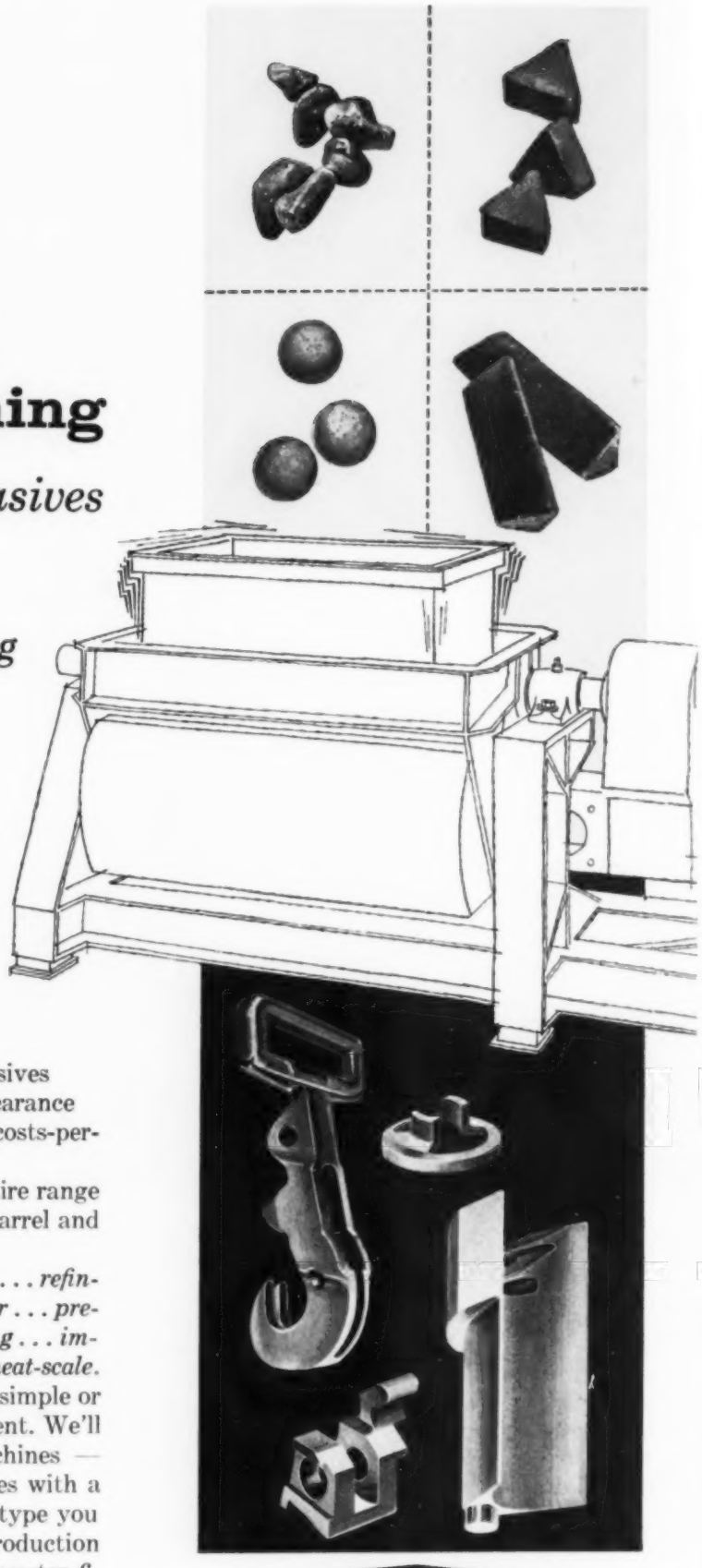
Barrel finishing is best finishing

...with TUMBLEX® abrasives

... in every type of rotating or vibratory equipment



Keeping pace with the latest advancements in barrel finishing equipment, Norton TUMBLEX abrasives are first in the field for best results with vibratory machines . . . developed for faster, lower cost finishing of the widest range of parts, especially the most complicated.

The recognized advantages of TUMBLEX abrasives help assure improved product quality and appearance — plus the fastest, easiest way to cut finishing costs-per-piece . . . by this new vibration method.

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ABRASIVES

G-409

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Standard Wheel Marking System: Wheel Structure

Testing Portable Grinding Wheels

Match Dresser, Grinding Wheel for Best Finish

Grinding and Finishing

For Better Production and Finishing with Abrasives

VOLUME 7. NUMBER 4 APRIL, 1961

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Editor's Mail

THE VANISHING AMERICAN ASSET

The essence of your editorial comment on this subject was certainly most stimulating. I couldn't agree more that complaining is not the answer to our problems.

It would seem, however, that American management has forgotten a vital portion of its responsibility which might carry your thoughts a little further, namely, that it is certainly part of any business leader's management job to do everything in his power to maintain an atmosphere in which his institution can continue to exist.

It would seem that the problem reaches much more deeply than one of high labor costs, low foreign competitive pricing, unreasonable capital equipment depreciation rates, etc., but rather to a final and definite decision on the part of all of us as to whether or not we want to be responsible for our own futures, or whether we would prefer to pass a higher and higher percentage of the fruits of our productive labor into the hands of "government" so that they can make our decisions for us and relieve us of the "burden" of taking the responsibility ourselves.

Mr. W. F. Schleicher makes the statement in his "A Final Thought" column, "The solution of any economic problem lies in you. Do not look to government." Again I could not agree more wholeheartedly, but it would seem that it is about time that the American businessman take his head out of the sand and spend a percentage of his time that is necessary in protecting an environment of individual freedom in which he can operate his business institution to the benefit of himself, his employees, and his nation.

There are a great many ways in which the businessman can participate other than simply writing to representatives in Washington (although this is certainly most important) but if we continue to accept with nothing more than complaints legislation and direction from a government conceived simply as a "referee," but which has obviously become anything but that, we must accept the consequences.

L. G. Evans & Company
J. R. Evans

STANDARD WHEEL MARKINGS

I read your article on pages 30, 31 and 32 of the February issue of GRINDING and FINISHING magazine, and I applaud the fact that, at last, some one sits down and tries to talk to grinding wheel users to explain to them the complexity of grinding wheels, which appear to most people to be simple.

I am certainly going to read with avid interest the issues that follow this one . . .

R-O Manufacturing Co.
W. A. Johnson, President

AIR-ELECTRIC GAGING UNIT

On page 51 of your February issue (Low-Cost Air-Electric Gage for Cylindrical) you publicized our "Econo-Sizer."

We notice that you have given this model number 133 M-96, whereas actually the model number is 133 M-296.

Probably there will not be too much harm done because as yet, anyway, we do not have an "Econo-Sizer" with the first model number. The most it can do is cause a little confusion.

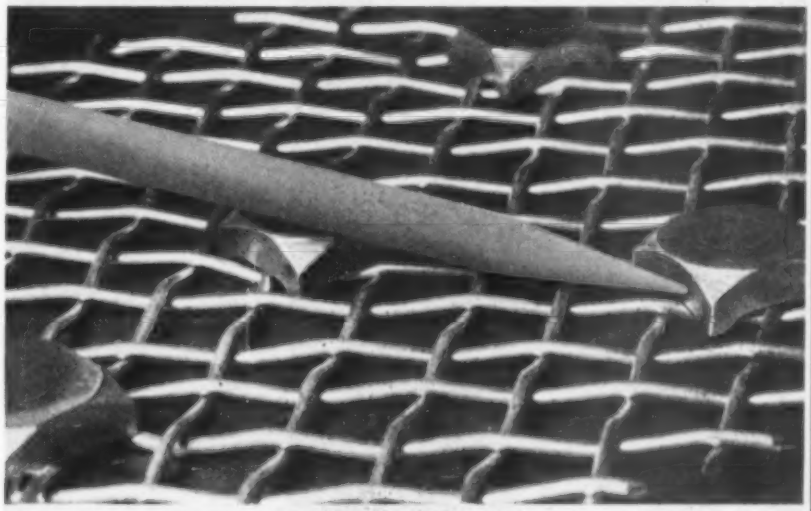
Federal Products Corp.
B. E. Wight, Ass't. Mgr.
Sales Promotion &
Advertising Department

Our apologies for the omission. The correct number is 133 M-296.

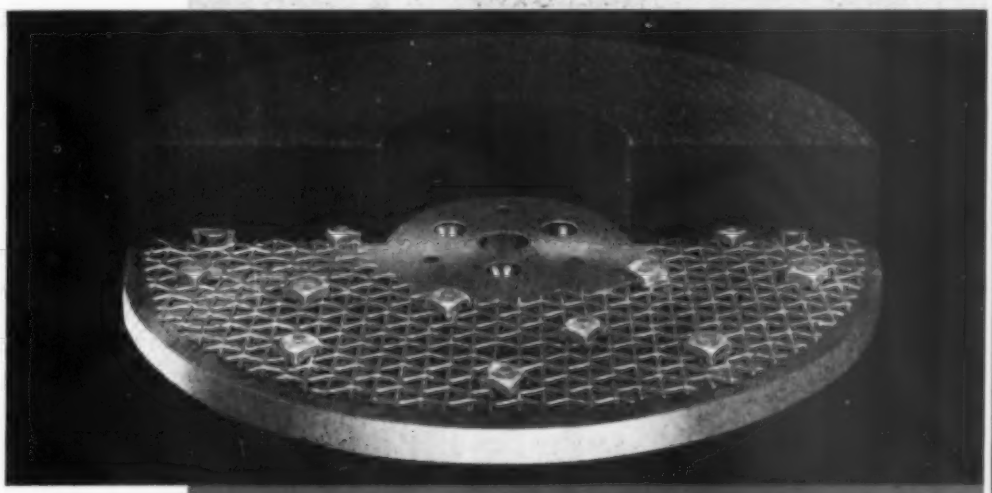
DISC SAFETY AND ECONOMY

with Gardner Wire-Lokt® construction

Heavy steel wire mesh becomes firmly embedded in the abrasive structure, actually forming a part of the abrasive backing.



Special steel anchoring nuts lock securely into wire mesh. In manufacture, abrasive is forced around and under steel mesh and nuts.



Full value is assured because usable abrasive extends right down to Wire-Lokt backing.

GARDNER

abrasive discs

BELOIT, WISCONSIN

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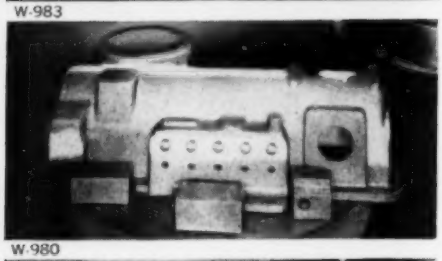

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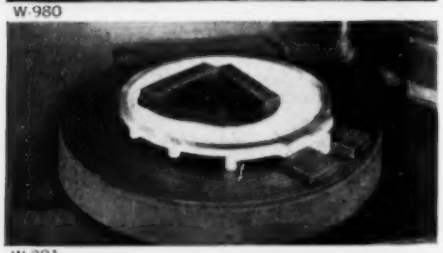

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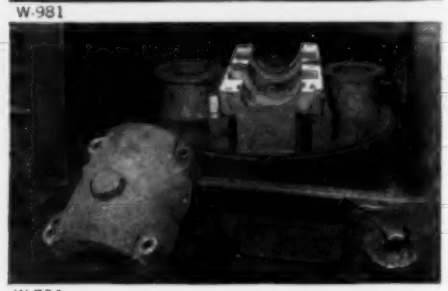

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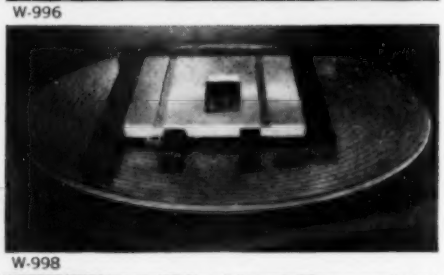

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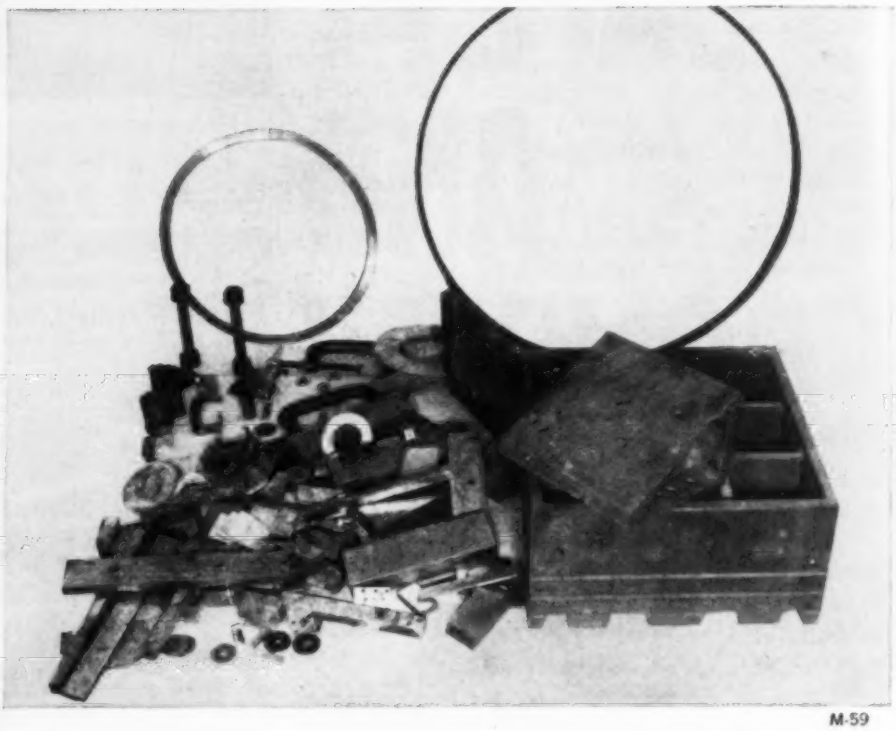


M-59

Use Industry's Least Expensive Fixtures . . .

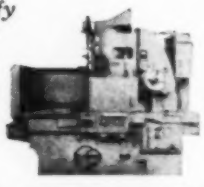
Normally, the Blanchard magnetic chuck will hold ferrous work pieces during the grinding cycle.

But when fixtures *are* needed — for holding irregular-shaped objects, whether ferrous or non-ferrous — you can usually select your "fixtures" from the nearest scrap pile.

For high-speed production, close-tolerance finishes and the most versatile grinding capabilities in existence . . . *put it on the Blanchard!*

Write today for your free copy of "Work Done on the Blanchard", Fifth Edition, and "The Art of Blanchard Surface Grinding", Fourth Edition.

For Best Results, Always Specify Blanchard Grinding Wheels for Blanchard Grinders.



No. 18

PUT IT ON THE BLANCHARD **THE BLANCHARD MACHINE COMPANY**

64 State Street, Cambridge 39, Massachusetts

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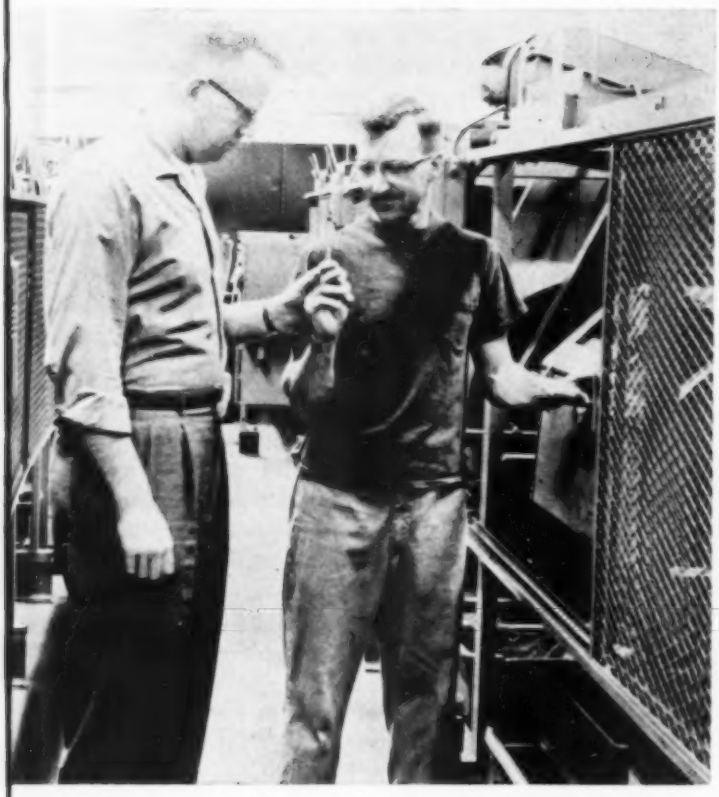
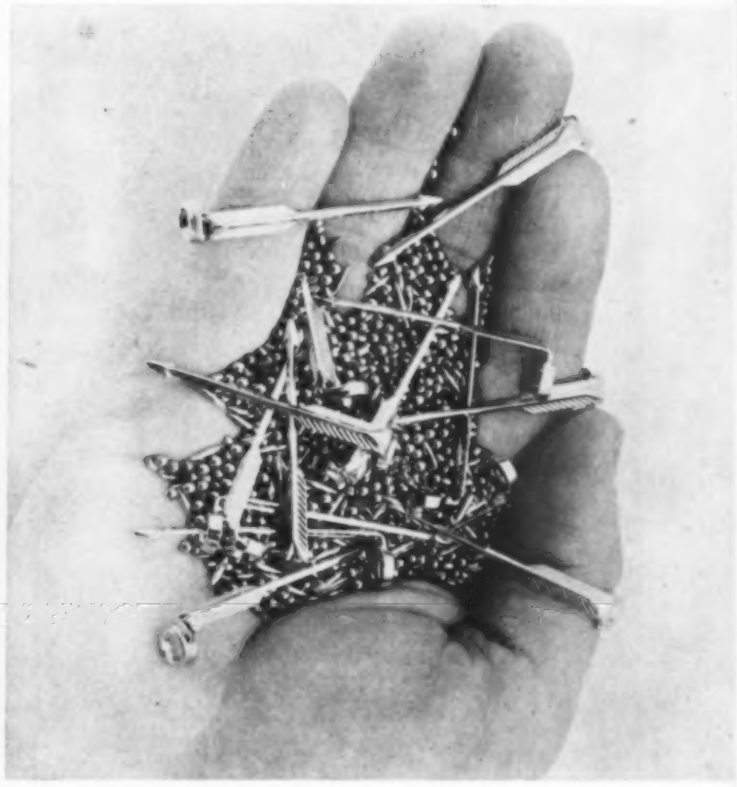
Design for Grinding

RICHARD L. McKEE • Managing Editor



Checking a part during its run. The open barrel at the right is one of twelve Tumb-L-Matic units at Parker Pen Company.



A sample handful of parts. Note the small sizes and the odd shapes. Stainless steel, brass, copper, gold and nickel silver are some of the metals represented.

. . . and the costs came tumbling down!

"Rolling out the barrels" boosts output per man-hour from 2,000 pieces to 40,000; cuts manpower requirements from twelve (trained) to one (unskilled); provides better product, less waste.

● The accomplishments of barrel finishing in deburring and polishing of small parts, as against manual operations, border on the fantastic.

Take the case of Harvey Blake, foreman of the metals department for Parker Pen Company, Janesville, Wisconsin, for instance. . . .

One of the operations for which Harvey is responsible is the deburring and finishing of 5½ million pen parts of various shapes, metals and sizes—but all small—per month.

Since the adoption of barrel finishing for this operation, production has rocketed to 40,000 per man-hour, as against a top of 2,000 by hand operations. He's using one loader-unloader, now, compared with twelve trained

continued

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SURFACE GRINDER
with
NEW... EXCLUSIVE
AUTOMATIC FORCED LUBRICATION

- Continuous flow, recirculating system
- Washes away damaging grinding dust
- Triples life of ways
- Preserves original accuracy
- Promotes easy table operation
- Reduces maintenance— *oils complete machine*

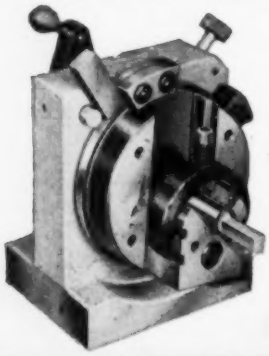
...and many other features included as standard equipment, all at a surprisingly low price!

WRITE FOR HARIG 612 BROCHURE

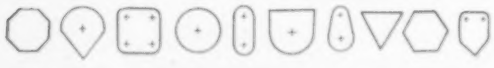
DIRECT DRIVE SPINDLE AND OIL PUMP

THE FASTEST WAY TO GRIND PERFORATORS . . . INCREASE ACCURACY

HARIG GRIND-ALL FIXTURE

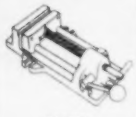


Easily grinds irregular shaped perforators concentric with shank within ± .0001 accuracy. Also can be used for milling, boring, and inspection. New features include V-block adjusting screw and sine arrangement to obtain any desired angle. Attachment available to convert Grind-all into precision Radius Dresser.



WRITE FOR NEW GRIND-ALL BROCHURE

OTHER PRODUCTS BY HARIG MACHINE TOOL DIVISION



VISES

RELIEF-GRINDING FIXTURE

AIR-FLO FIXTURE

WRITE FOR BROCHURES

5769 W. Howard St. • Chicago 48, Ill.

VISIT HARIG BOOTH 1514 (A.S.T.E. Show)
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. . . AND THE COSTS CAME TUMBLING DOWN!

continued

polishing operators. And he's getting a more uniform product, without as much scrap.

"Most of our parts are run by a two-step method," he says. "First, they are cut down or smoothed, and second, they are barrel polished. Because these parts are small, a full day's production requires only minutes of loading and unloading time.

"Some of our parts could not be made if the tumbling barrel did not make it possible to finish them. These parts are of unique shapes and sizes which could not otherwise be polished except at extreme cost," he concludes.

Twelve Tumb-L-Matic Type F two-barrel units are used.

Each unit contains two compartments per barrel, or four per unit. An individual clutch arrangement allows single barrel control. Hence, each barrel can be set for optimum speed and best finishing of a particular part.

This type of equipment allows the division of larger masses of work into small loads, and results in finer finishes than would otherwise be obtained.

Better uniformity of product has lightened the load on inspection, though it has not significantly reduced inspection personnel or costs.

Details of the tumbling process, including media, compounds, length of runs, and related matters, were worked out jointly by Parker and Tumb-L-Matic engineers. • • •

"Who put that abrasive powder in the bath tub?"

SAM SAFETY SAYS:

No. 20 of a series • GRINDING and FINISHING • A Hitchcock Publication • 1961

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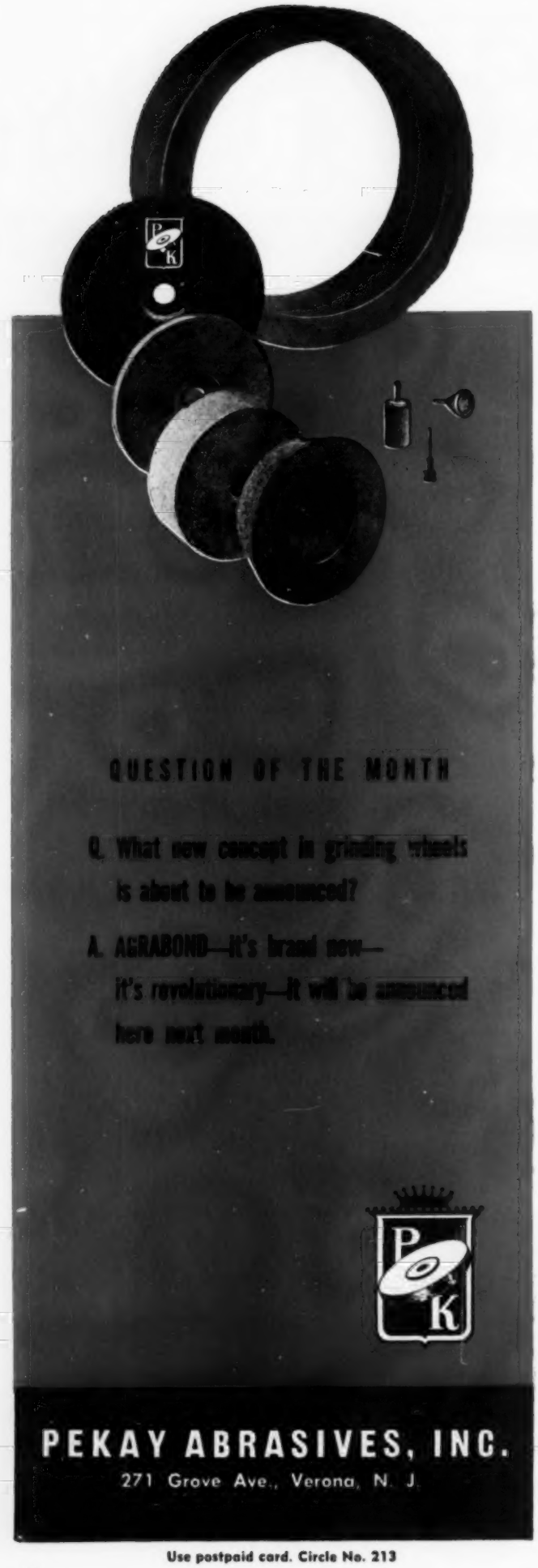
QUESTION OF THE MONTH
Q. What new concept in grinding wheels is about to be announced?
A. AGRABOND—it's brand new—it's revolutionary—it will be announced here next month.
PEKAY ABRASIVES, INC.
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Standard Shapes Brochure

New American Standard

● The American Standards Association has approved new ASA standard specifications for shapes and sizes of grinding wheels and has issued a new publication, "American Standard Specifications for Standard Shapes and Sizes of Grinding Wheels, B74.2-1960."

An American Standard is intended as a guide to aid manufacturers, consumers, and the general public. It implies a consensus of those substantially concerned with its scope and provisions.

These new standards classify, according to twelve end use categories, the shapes and size of grinding wheels which are considered standard by industry. A shape and size of wheel has been included only after determining, on the basis of sound engineering practice, whether or not it is dimensionally designed to perform the job for which it was intended.

This publication supplements and replaces the prior publication, "Standard Shapes and Sizes of Grinding Wheels, Simplified Practice Recommendations, R45-57."

The foreword of the publication continues as follows:

"The wide diversity in use (of grinding wheels) coupled with many designs and sizes of machines on which the wheels are used makes standardization . . . essential in order that they be readily available to industry.

"It is recommended that the information listed in this Standard and in the ASA Safety Code B7.1-1956 be followed and referred to when considering a grinding wheel design for use on a new machine or a new operation."

The standard covers basic shapes and sizes. Specialized abrasive wheels such as diamond wheels, mounted wheels, abrasive discs and plate mounted wheels are not included.

Adherence to the new standards reacts to the mutual advantage of all interested parties—users, manufacturers, and distributors.

The advantages of standard wheels are not spelled out, but they should be obvious. (See "Right Size Wheels Cut Grinding Costs" GRINDING and FINISHING, Vol. 6, No. 1, January, 1960, pp. 52-55.) More abrasive per dollar, in many instances, and faster replacement are two common benefits. For the manufacturer, longer production and lower investment in inventory of special wheels are indicated. For the distributor, smaller inventories and better service seem to be results.

The new publication ASA B74.2-1960 may be obtained without charge from the Grinding Wheel Institute, 2130 Keith Building, Cleveland 15, Ohio.

Research Project Probes Complete Abrasive Machining

● "Abrasive Machining" is the subject of an intensive research project now in progress at Norton Company. The results of this study are expected to show that machining of castings and cut-off steel stock to final finish dimensions can be economically accomplished entirely with abrasive products. In many cases, abrasive machining will prove to be more economical than the use of conventional cutter type machine tools now used to remove stock.

"Just because machining of metal has always been done in a certain way, there is no assurance that traditional methods are the best that can be used," says Norton President, Ralph F. Gow. "An abrasive wheel is actually a chip-making tool with an almost infinite number of cutting teeth. It is a throwaway type, self-sharpening tool which can be manufactured to suit any specific machining operation.

"For years, it has been common machine shop practice to remove stock by metal type cutting tools and using grinding wheels, if necessary, to produce the final dimensions and surface finish. Modern developments in both grinding wheels and the machinery on which they are employed indicates that this is an excellent time to thoroughly examine abrasive machining as an economical method of reducing present high costs of manufacturing.

"In this project, we will be working with people both in our own organization and in plants throughout the country who have the vision to foresee a completely new approach to metalworking."

The Norton study will approach the subject of abrasive machining from the standpoint of the equipment required and of the economics involved. For some time, the company has been co-operating with several machine tool builders and research organizations who have been investigating certain aspects of abrasive machining.

The first phase of the Norton project is the correlation of available information from all sources. Information thus gained will determine the areas of applications which appear most promising for the second phase of the project—mechanical research into the equipment and techniques of applying abrasive machining.

Initial findings indicate that the greatest potential savings in the use of abrasive machining may be in the fields of flat surface machining and in slotting and grooving applications because of the suitability of presently available equipment.

With further developments in abrasive machinery, these savings will no doubt be extended to the area of cylindrical machining.

QUESTION OF THE MONTH

Q. Do you know how many diamond particles there are to a carat in the various mesh sizes? 20-30 mesh? 40-60 mesh? 80-100 mesh? 170-200 mesh?

A. 20-30 mesh, approximately 300 particles.
40-60 mesh, approximately 1850 particles.
80-100 mesh, approximately 15,000 particles.
170-200 mesh, approximately 75,000 particles.

Do you wonder why on some applications stock removal may be faster with finer grit sizes? This is due to the vast increase in the number of working diamond particles on the work face of the diamond wheel.

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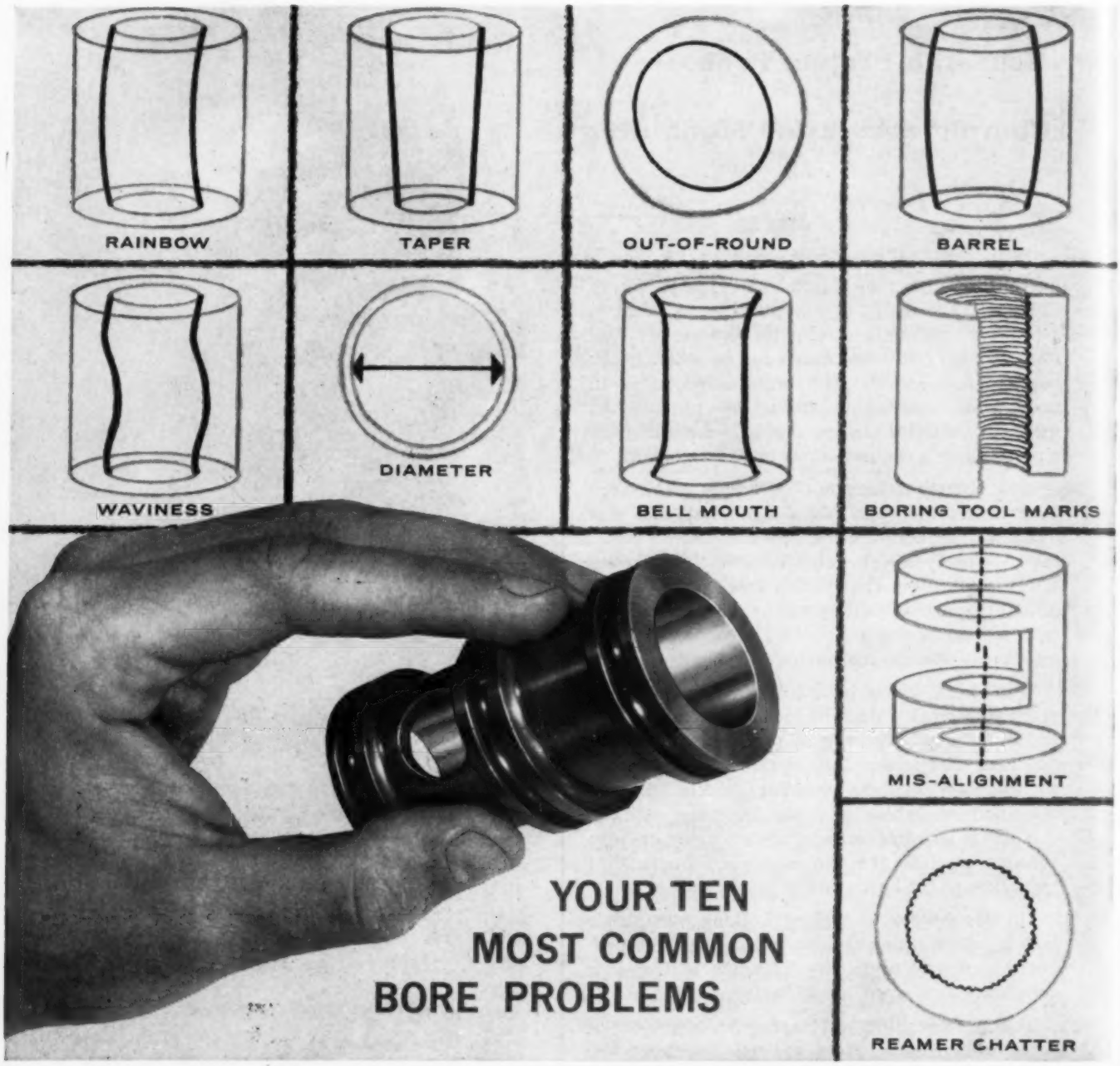

All these bore errors from previous operations can be corrected fast and with minimum stock removal by Sunnen Honing.

This fast abrasive stock removal process is often used to take out substantial amounts of stock as well as for final sizing.

Stock is removed first from all high spots in the hole, immediately generating perfect roundness and straightness without changing original hole alignment. Tolerance is guaranteed to .0001", with any desired surface finish.

When you specify Sunnen Honing for your I.D. operations, you eliminate delayed schedules and bottlenecks as well as scrap and salvage costs caused by hole problems.

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Editor's Page

Something new has been added

You will note a new approach to the article presentation in this issue. Three of the articles are in a new format which to our knowledge has not been used before. The objective is to provide you with the same amount of information in a more concise manner thus reducing your reading time.

We have long realized your need for less reading time and also your need for more and more information on abrasive machining. The large amount of reading and the increasing demands for short delivery time has greatly increased the requirements upon your time. Specialization has also made its impression on the daily hours. Specialization has complicated the vacuum of clarification and edification. The rapid increase in abrasive machining from approximately 26% of the metal cutting operations ten years ago to the 42% today, further emphasizes the need for more information in less space. This all points up your rise in importance in industry and your increased responsibilities.

From our reader service cards, the answers to the two questions have added to the information gathered from our trips in the field. With this combination, we know your problems. It has therefore, become our goal to fill the vacuum and reduce the time element.

You have undoubtedly noticed the improvement in layout and with this issue, we wish to specifically point out three stories which are verbally new in presentation. On page 18 the cover story is presented with brief body copy which can be read quickly and still cover clearly the basic rules discussed. Following this material are five examples which illustrate in range the rules as they should be applied. Photos of before, after and set-up visually emphasize results.

On pages 30 and 32 are two stories in which we have first the subject in general and then an outline of the facts. By outlining the facts we greatly reduce your reading time. This style also enables us to enlarge the photos so that they are clearer and more beneficial.

It is now in your hands. If you like what we have done and in effect we have anticipated your needs we would like to hear about it.

W. W. Patterson

Basic rules for efficient cutter sharpening

The three basic rules are scheduling, using the proper grinder and using proper techniques. Examples of the use of proper grinding procedures and the times required for typical good grinding techniques will increase understanding of this subject.

By **MARSHALL CRAIG,**
Sales Engineering, Union Twist Drill Company, Hartex Division

A cutting tool must be properly sharpened—or resharpened, or the machine on which it is used cannot perform at top efficiency. A machine tool costs thousands of dollars. A cutter, in contrast, costs very little, but it determines the working value of the machine tool.

Consider what happens when a dulled or improperly sharpened cutter is used. First, you'll get a poor finish, and in many cases a loss of tolerance. The last 10-15% of a production run can turn out to be rejects. Because of a poor cutting tool, feed speeds have to be slowed down—losing both time and money. A dull tool will cause undue vibration that can create excessive wear and tear on the machine tool. Often a job is delayed due to the extra time needed to restore a worn cutter to working condition.

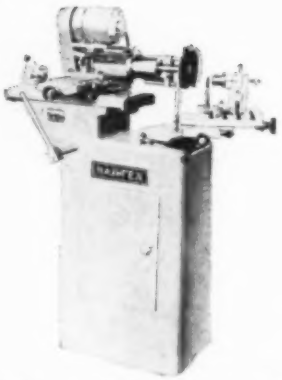
Because so much depends on "so little," a thorough study of grinding procedures should be made. Since space limitations prohibit this, we shall concern ourselves with only three, but three very basic rules.

Rule No. 1—A schedule should be used for systematic sharpening.

Cutting tools should always be sharpened according to a definite schedule. The easiest way to establish this schedule is to determine, by trial, the number of parts that can be safely run between sharpenings. Cutters should then be sharpened at the conclusion of this period, regardless of their condition.

Rule No. 2—The proper grinder should be used.

Serious consideration should be given to the type of grinder used. Only by using the proper equipment, coupled with recognized procedures and methods, will you be assured of getting the full use and value of your cutting tools. Remember, the tool manufacturer provides the cutter with its original accuracy, but it's up to you to maintain this accuracy. It's an easy job to maintain a cutter when it is properly cared for, and the savings in time and money are considerable. There are many good grinders on the market—all designed specifically for cutting tool work. In the illustrations accompanying our next rule, the work was done on a Hartex No. 3 Tangent-Arc Profile Grinder. This grinder has recently been made available to the cutting tool industry after having been designed and used by the Union Twist Drill Company for many years in the manufacture of cutting tools.



Rule No. 3—The proper grinding techniques should always be used.

This rule can never be too strongly stressed. You have seen what can happen when these techniques are not used. A neglected cutter is money down the drain. It may not seem to be much, but it soon can snowball into a large expense item.

The following examples illustrate good cutter maintenance. In each case we take a commonly used cutter and show it before and after grinding. The grinding times shown for every tool are typical of good grinding procedure, although the cutters, all badly worn, are not typical of good cutter care.

continued

HARTEX NO. 3 TANGENT ARC PROFILE GRINDER

Set Up And Grinding Time Analysis Based On Stock Removal Of .005-.010 Per Tooth. Carbides Or High Speed Steel. Set Up And Grinding Times Based On Single Piece Application.

TOOL	SIZE	NO. OF TEETH	OPERATION	SET UP TIME	GRINDING TIME
Chucking Reamer	5/8" x 9 °/A	6	Clear Diameter 2-1/4" Cut	3 Min.	1-1/2 Min.
Chucking Reamer	5/8" x 9 °/A	6	Clear 45° Chamfer 1/32	3 Min.	1/2 Min.
Side Milling Cutter	4" x 3/8	22	Clear Dia. Primary And Secondary	3 Min.	4 Min.
Side Milling Cutter	4" x 3/8	22	Clear 1/8 Radius Both Sides	5 Min.	10 Min.
Staggered Tooth Side Milling Cutter	4" x 3/8	18	Clear 1/8 Radius Both Sides	6 Min.	10 Min.
Staggered Tooth Side Mill	4" x 3/8	18	Clear Top Teeth Primary And Secondary Clear	8 Min.	5 Min.
Metal Slitting Saw	5" x 3/32	30	Grind Full Radius	5 Min.	10 Min.
Staggered Tooth Side Mill	5" x 3/16	40	Grind Full Radius	7 Min.	20 Min.
Woodruff Keyseat Cutter	1-1/2" x 3/8	14	Clear Top Teeth Primary And Secondary	3 Min.	2 Min.
Spiral Flute Ball End End Mill	1/2"	2	Primary Clearance Ball End	6 Min.	1 Min.
Spiral Flute Ball End End Mill	1/2"	4	Primary Clearance Ball End	6 Min.	2 Min.
Plain Milling Cutter	3" x 3"	16	Primary And Secondary Clear Top Teeth	4 Min.	15 Min.

Note badly worn corner as well as rolled edge on face of tip.

EXAMPLE No. 1

CARBIDE TIPPED SHELL END MILL—
4" DIAMETER, 6 TIPS

Grinding Procedures:

1 — Cutter is mounted on a standard work arbor so that cutter is rotating on its own axis. A wheelhead finger is used so that the finger will follow helical tooth.

2 — Primary clear top teeth .008 stock removal ..... 1 minute
3 — Secondary clear top teeth ..... 2 minutes
4 — Secondary end teeth ..... 4 minutes
5 — Primary clear end teeth ..... 3 minutes
6 — Primary clear .020 radius ..... 1 minute

Grinding time ....11 minutes
Setup time ..... 9 minutes

TOTAL TIME ...20 minutes

EXAMPLE No. 2

STAGGERED TOOTH SIDE MILLING CUTTER— 4" x 5/16"—18 TEETH

Grinding Procedures:

1 — Cutter is mounted on a standard work arbor. Finger assembly is mounted on the wheelhead so as to follow the axle rake of alternate teeth.

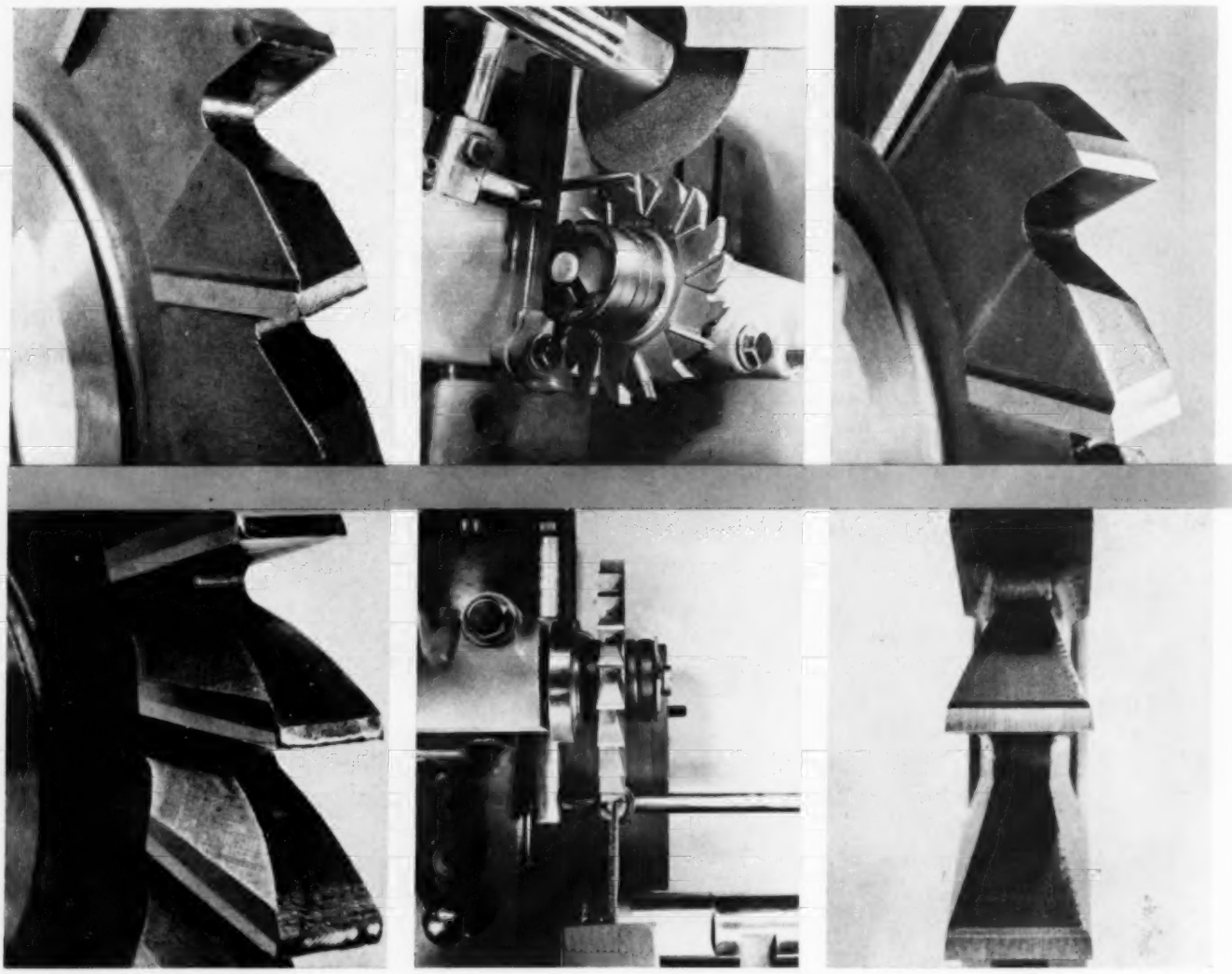
2 — Primary clear top teeth—.010 stock removal per tooth ..... 5 minutes

3 — Secondary clear top teeth—.005 stock removal per tooth ..... 1 minute

Grinding Time .... 6 minutes
Setup Time ..... 3 minutes

TOTAL TIME .... 9 minutes

Through over-use, the cutting edges have built up.



Notice badly rolling corner of teeth and wear land on top teeth of approximately 3/64".

EXAMPLE No. 3

SIDE MILLING CUTTER— 4" x 3/8"—22 TEETH

Grinding Procedures:

1 — Cutter is mounted on standard arbor using snap finger which is attached to the work holder.

2 — Secondary clear top teeth .010 stock removal per tooth—¼ width of tooth ..... 6 minutes

3 — Primary clear top teeth .010 stock removal per tooth—1/16 width of land ..... 3 minutes

Grinding Time .... 9 minutes
Setup Time ..... 4 minutes

TOTAL TIME ...13 minutes

EXAMPLE No. 4

DOUBLE ANGLE CUTTER—2¾" DIAMETER, 18 TEETH

This cutter has also been used too long before resharpening, causing flaking of the cutting edge and necessitating a great deal of stock removal.

Grinding Procedures:

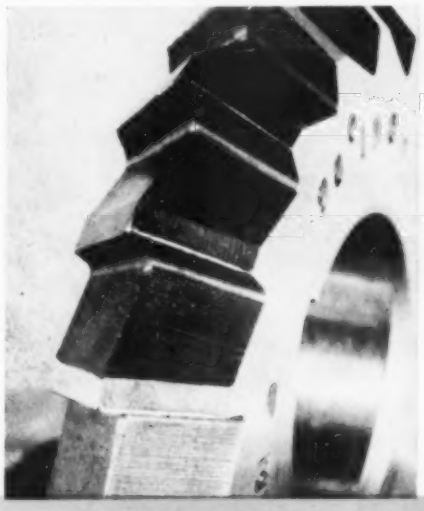
1 — Cutter is mounted on standard work arbor using snap finger assembly mounted on wheelhead.

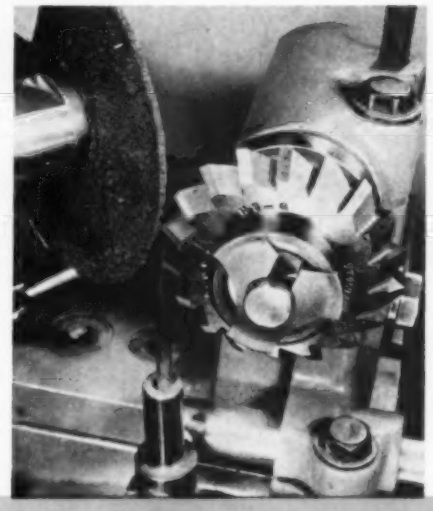
2 — Primary clear both angles—.010 stock removal per tooth ..... 5 minutes

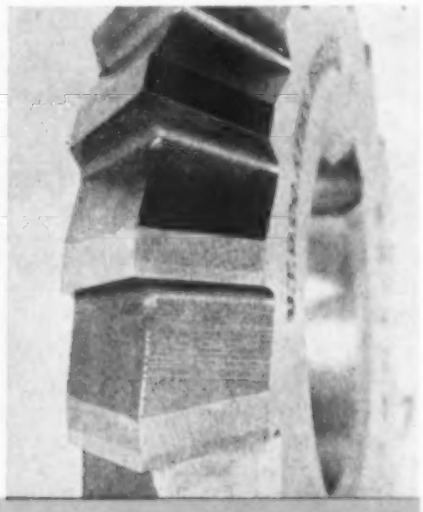
3 — Secondary clear both angles—.005 stock removal per tooth ..... 2 minutes

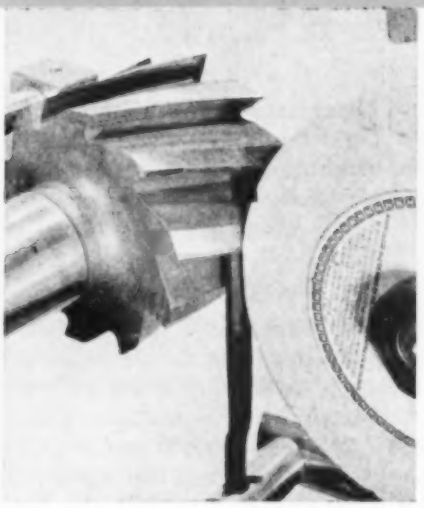
Grinding Time ... 7 minutes
Setup Time ..... 4 minutes

TOTAL TIME ...11 minutes









Extreme wear is apparent on the entire tooth. A great deal of stock removal is required to restore this cutter.

EXAMPLE No. 5

SPIRAL CUT TAPER SHANK END MILL—10 TEETH

Grinding Procedure:

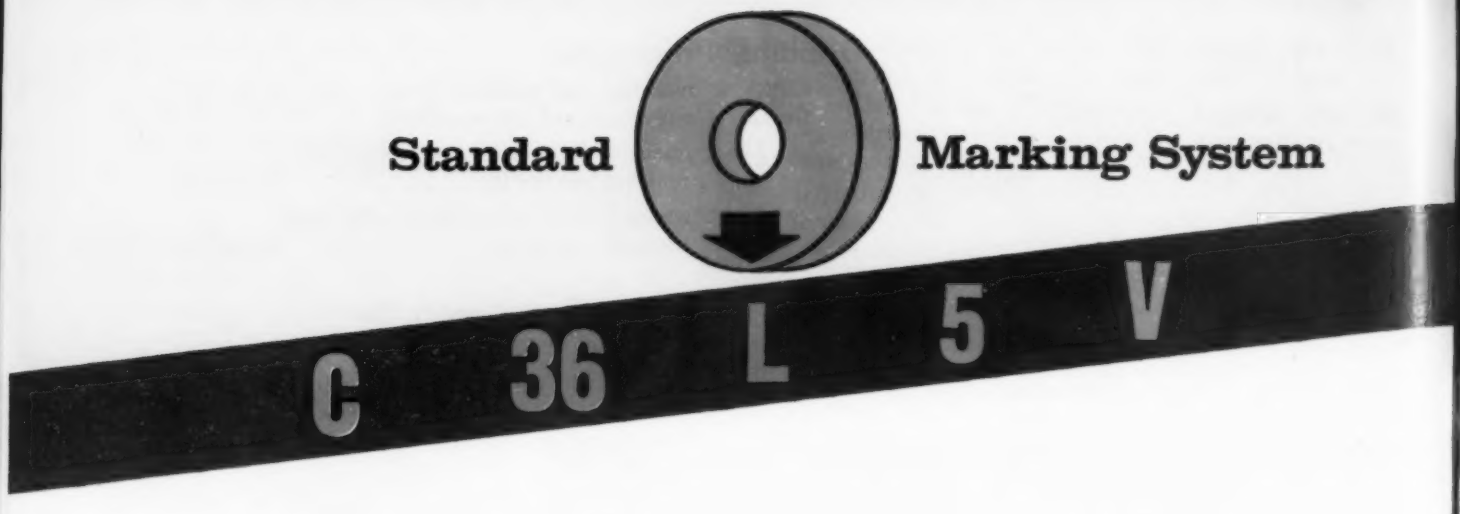
1 — Cutter is held between centers, and finger assembly is mounted on wheel head so as to follow spiral tooth as wheelhead is reciprocated.

2 — Grind secondary clearance on top teeth —.025 stock removal per tooth, ¼" width of land .....10 minutes

3 — Grind primary clearance—.010 stock removal per tooth, 1/16" width of land ..... 6 minutes

Grinding Time ...16 minutes
Setup Time ..... 6 minutes

TOTAL TIME ...22 minutes



What you should know about WHEEL GRADE

WHEEL GRADE											
	Soft	A	B	C	D	E	F	G	H	I	
	Medium	J	K	L	M	N	O	P			
	Hard	Q	R	S	T	U	V	W	X	Y	Z

By RICHARD L. McKEE Managing Editor

● "Anyone who understands wheel grade understands grinding wheels."

Few abrasive engineers would take exception to this generalization, though it might be difficult to sustain. It does underscore the importance of grade in grinding wheel applications.

Grade is a term employed to describe the tenacity with which the bond holds abrasive grain in the wheel during grinding. It is also one of the most elusive and frustrating concepts in the field of grinding and finishing.

Much of the confusion arises because wheel grade is a quality which is difficult to describe and which has never been satisfactorily defined in quantitative terms.

Part of it results from the use of the terms "hard" and "soft" in other than their general sense.

Alphabet Indicates Grade

A third difficulty is that an abrasive wheel "is" a given grade, but that variations in the conditions of its use can cause it to "act" like a different grade.

In the standard marking system grade is expressed by a letter of the alphabet immediately after the grain size numbers, and with or without a break, as follows:

JA244-**F**10VP
32A46-**J**8VG
A-80**S**9-BA2

Letters in the range from A to I, as in the first example above, indicate "soft" wheels, meaning that it is relatively easy to tear the grain from the wheel. Symbols in the Q-Z range designate "hard" wheels, in which the grain is held tightly by the bond. Medium grades, of course, fall between. These groupings are only approximate, but they suggest general industry usage.

Grade Is Intangible

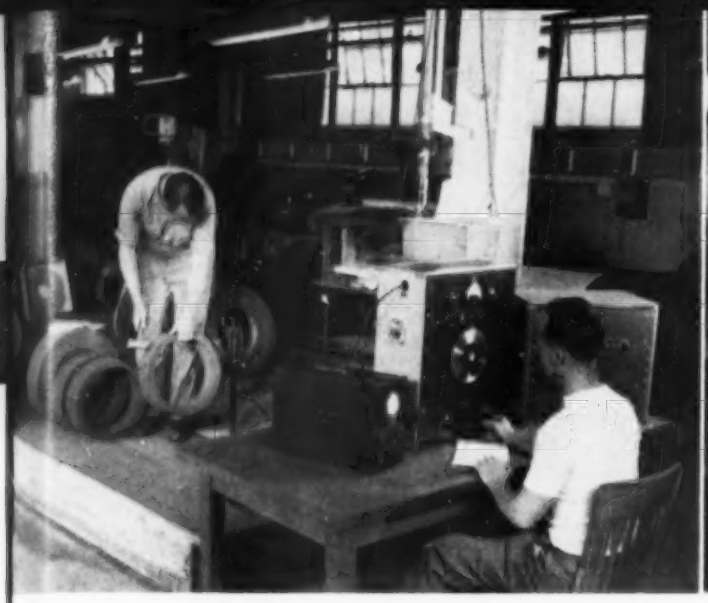
Wheel grade is a quality developed in the manufacturing process. In this respect, it contrasts with abrasive type and grain size, the subjects of the first two sections of this series, and with bond, which is the concluding section.

Abrasive grain and bond are wheel ingredients which, while varied, have measurable characteristics. Grain size is an attribute with accepted, if broad, limits.

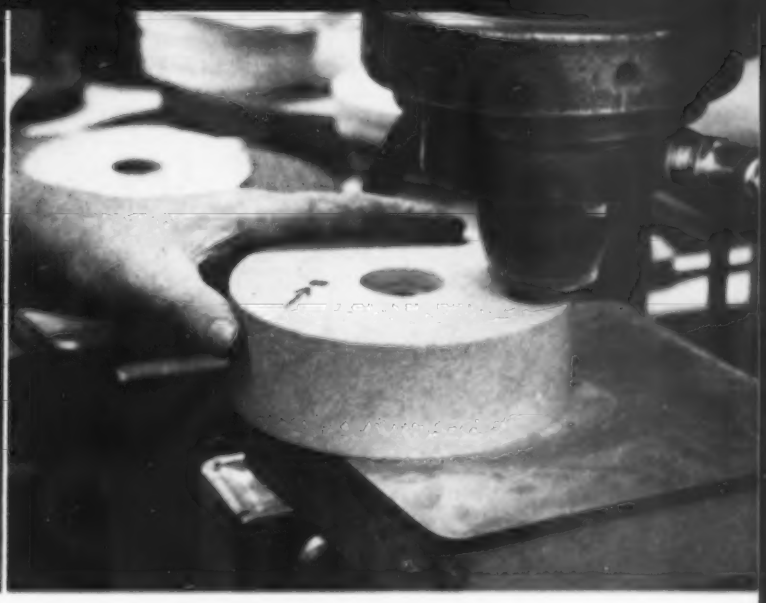
Grade, however, has no generally-accepted quantitative definition. It is based on the proportion of bond to grain in the original mix. It is checked during manufacturing by in-process controls. It is verified during final finishing and inspection by either mechanical or electronic means. The nominal grade which appears in the wheel marking reflects all three determinations in varying degrees.

In operation the wheel is said to "act hard" or "act soft" depending on whether the grain is held more tightly

This is the third article of five on the standard marking system which will appear monthly until June, 1961. The first articles dealt with abrasive grain types and grain size. Succeeding articles will discuss structure and bond types. Reprints of the complete series will be available about July 1. Tear sheets of individual articles will be available as long as the supply lasts.



Sonic testing of wheel grade. Tapping a wheel held against the microphone sets up a vibration which can be measured and interpreted on the oscilloscope. (Norton Co. photo).



One type of mechanical wheel grading. The depth of the hole created by a measured blast of sand reflects the grade or hardness of the wheel. (Norton Co. photo).

or less tightly than is normal for the nominal grade. Any grinding condition which aids or hinders the retention of the grain in the wheel makes the wheel act harder or softer, respectively.

It must be re-emphasized, of course, that a grinding wheel must wear to be efficient. But if the wheel is too soft for the application, the grains will be torn out before they are fully used, with resulting waste. If it is too hard, grain will be retained after it has become dull and glazed, and the wheel will rub and burn the work instead of cutting it.

Unraveling this tangle requires some review of the fundamentals of grinding wheel composition.

A grinding wheel is not solid. It contains abrasive grain, bond to hold the grain together, and voids. For strictly non-technical comparison, it resembles a popcorn ball. If a lot of popcorn is mixed with a little molasses, the resulting balls are easily broken apart. The more molasses is used, the harder it is to divide a ball. The popcorn corresponds to the grain in the wheel, and the molasses to the bond.

In the wheel the grain is supported by a network of bond "posts." If the network is weak, the grain will shed easily, and the wheel is soft. If the network is thick and strong, the grain is held tightly and the wheel is described as hard.

The nature of bonds and their effect on grade will be more fully discussed in the section on bonds. At this point, two broad statements would be sufficient. Vitrified (ceramic) bonds can be manufactured over the complete range of grades, but tend to be concentrated in the medium and medium-soft ranges. Resinoid bonds, which are more plastic, are primarily in the hard grades.

The porosity of grinding wheels, like the popcorn ball, is easily demonstrated. The imbalance of a wheel partly immersed in coolant is one proof. The practice of feeding coolant through the wheel is another.

Grading Is Old Problem

The nominal grade of a wheel as it is shown in the grade symbol is determined from the checks made during finishing and final inspection. This is an old problem in grinding wheel manufacture.

One of the first methods of grading, is described in **The Norton Story:**

"By digging a little metal tool (a close relative of the screw driver) into a wheel, John (Jeppson) made the classification of grade . . . deciding whether a wheel was soft, or hard. . . .

"At first there were no standard grades of hardness for wheels. Wheels were custom-made, each for its own kind of work. A graduated scale of hardness eventually evolved from the sales records which were kept on file.

"Thus the grading system was not an arbitrary one of rigidly set degrees.

"Grading took considerable training . . ."[2]

Current Grading Equipment

A mechanical grader was a natural successor to hand grading. This method involves a mechanical means of making an indentation in the wheel. The depth of the indentation determines the grade of the wheel—i.e., the deeper the hole, the softer the wheel.

A still more recent development is sonic or electronic grading. This method is based on the principle that in ". . . . supposedly identical grinding wheels, the natural frequency of vibration of each wheel is a sensitive measure of even minor differences."[3]

Even more sophisticated means of measuring the grade of wheels are reported in development. With such means—and this is perhaps possible with methods now available—it may be practical to arrange wheels in a given shipment for a volume application in some sequence of minor variation of grade, so that production can continue with minimum adjustments to the machine.

Operational Grade Varies

The discussion so far has been concerned with nominal or normal grade. However, considering grade as a measure of a wheel's ability to retain abrasive grain, certain elements in a particular application can make the wheel appear harder or softer.

The chip-cutting ability of grinding wheels appears to be well-established. Other factors remaining equal, any increase in depth of cut should increase the forces tending to pull the grain out of the wheel, and would consequently make the wheel appear softer. Any factor which decreases the depth of the cut makes the wheel seem harder.

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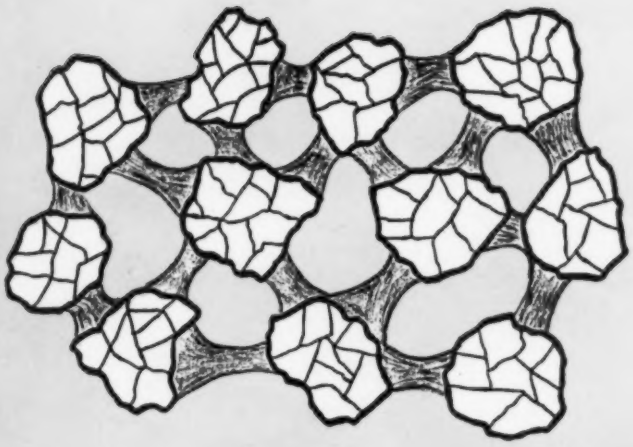
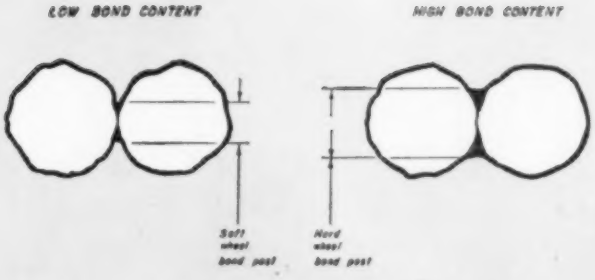




Comparative sketches showing soft and hard grade wheels. (Photo—Cincinnati Milling Machine Co.)

A much enlarged sketch of abrasive grains in a matrix of bond posts, drawn with considerable artistic license. Actually, in a wheel each grain probably touches at least one other grain. (Photo—Cincinnati Milling Machine Co.)

The following generalizations sum up some of these factors for cylindrical grinding. The basic principles apply to all types of grinding.

Other factors being the same:

1. Increase of work speed increases grain depth of cut and makes the wheel appear softer.
2. Decrease of work speed has the opposite effect.
3. Increase of wheel speed decreases grain depth of cut and makes the wheel appear harder.
4. Decrease of wheel speed . . . makes the wheel appear softer.
5. Reducing diameter of grinding wheel increases grain depth of cut and makes wheel appear softer.
6. Increasing wheel diameter makes wheel appear harder.
7. If the work diameter is reduced, grain depth of cut increases and makes the wheel appear softer.
8. If work diameter is increased, the wheel appears harder.[4]

The operational grade or grinding action of a wheel is also affected by the coolant, the friability of the grain, and other factors too detailed to be discussed here.

Selection of Grade

Choosing the optimum grade in a grinding wheel specification requires consideration of the material being ground, the condition of the machine, and most important of all, the area of contact between the wheel and the work. It is often the most critical part of the specification.

Hard materials require soft grade wheels and soft materials need hard grade wheels. On dense, hard metals penetration is difficult, and the grain dulls quickly. In a soft wheel these worn particles will be easily shed, and new, sharp grain will be exposed. For easily abraded materials the hard wheel can dig in to remove stock. Grain wear is not so great a problem.

Condition and location of the grinding machine is a second factor affecting grade. Worn spindles or other major machine parts, or a location on an upper floor of a wooden building calls for a harder-than-normal wheel. On the other hand, if the machine is in tip-top condition, and is installed in a way to reduce or eliminate vibration, the grinding wheel can be definitely softer in grade.

Area of contact between the wheel and the work is the most critical factor in grade selection. Other considerations being equal, the wheel with the greater area of contact needs to be softer. In cylindrical grinding, with a small area of line contact and relatively high unit pressure, medium-hard wheels are recommended.

In vertical-spindle surface grinding with either segmental or Type 2 cylinder wheels, with a large flat area of contact and light unit pressures, soft grade permits the wheel to break down and in effect resharpen itself.

On the other end of the scale, ball grinding wheels, with only a point of contact between the work and the abrasive, are among the hardest wheels manufactured.

Problems of Grade Comparison

The intangibility of grade, in the first place, and its susceptibility to variation because of differing grinding conditions, points up the problems in the way of a general comparison chart. Differing mix formulas, varying manufacturing processes, and dissimilar methods of determining nominal grade also stand in the way of such a project.

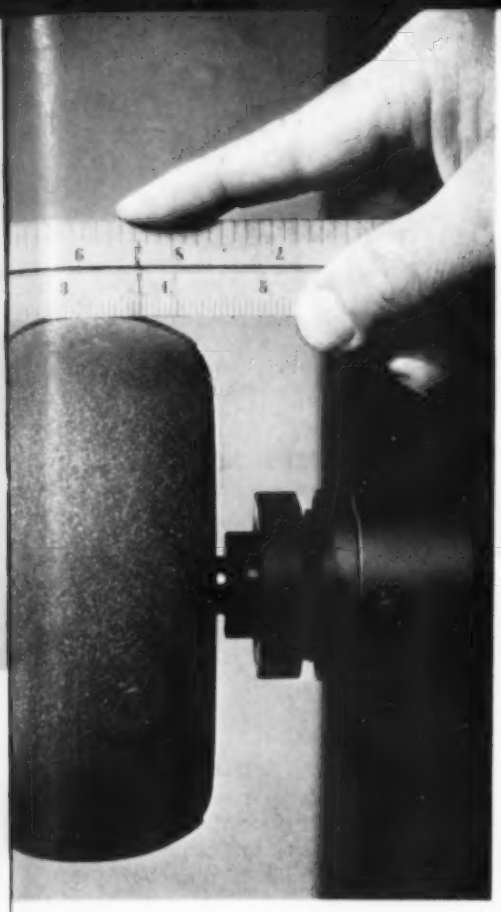
However, on a given operation where there is a sufficient volume of wheel usage, and where the variables can be held to a minimum, it is feasible to make such a comparison, reliable enough for practical use. But this is a custom job, and the conclusions reached probably will not apply on other operations.

The intricacies of grade should never blind any user to the great potentialities of grinding wheels. Grade is one factor—and a very important one—in a wheel's performance. It must always, however, be considered along with the other elements of the wheel. The standard wheel marking indicates the tenacity of the wheel in holding grain when operating at normal speeds on the usual run of work for the given size. • • •

REFERENCES

1. For a more detailed discussion of the wheel manufacturing process, see "What You Should Know About Wheel Manufacturing," GRINDING and FINISHING, Part 1, September, 1959, pp. 30-34; Part 2, October, 1959, pp. 41-45.
2. M. M. Tymeson, *The Norton Story*, p 51. Norton Company, Worcester, Massachusetts, 1953.
3. "Wheel Grading by Frequency," GRINDING and FINISHING, July, 1960, p. 43.
4. Lewis, K. B. (Rev. Ed. by Schleicher, W. F.) *The Grinding Wheel*, Grinding Wheel Institute, Cleveland, Ohio, 1959. p. 47. Chapter 5, pp. 42-49, is a fuller discussion of the theory of grain depth of cut and its effects.

Self-crowning abrasive bands grind contours



A straight-edge shows the degree of crown which can be developed in the new coated abrasive bands when run on an inflated drum.

A coated abrasive band (below) is crowned only slightly, but enough to prevent edge-cutting as a pneumatic grinder brings up a finish on a conical stainless steel vessel for use in food processing.

● Coated abrasive bands and belts which assume any desired degree of crown when run on inflatable rubber drums have been developed by Behr-Manning Co. of Troy, N.Y., a division of Norton Company, in co-operation with Nu-Matic Grinders, Inc., of Cleveland, Ohio.

Suited for both stock removal and polishing, these new products are recommended for offhand work in confined areas, and particularly on concave or other contoured surfaces. Their crowned shape eliminates the edge cutting that occurs when a flat band is inadvertently tilted, permits accurate grinding on extremely narrow areas, and diminishes chattering when operated at low pressures.

They are made of aluminum oxide abrasive in grits 40 through 180 on X-weight cloth, bonded with all-resin adhesives; they are designed for use on smooth-faced or serrated "Valcore" drums made by Nu-Matic.

Bias-cut but not molded, the new bands assume a crowned shape when the pneumatic wheel or drum is inflated. Once the crown has been generated, pressure may be reduced to match woodworking requirements. "Kontoor" bands are available in three sizes: 2″ x 9⅝″ for the Valcore Model 320-C, with maximum speed of 6000 rpm; 2½″ x 15½″ for Model 525-C, with 4500 rpm maximum; and 2″ x 19″ for the 620-C, not to exceed 4000 rpm.

These bands will not take an exact shape; instead, their degree of crown will depend on grit size, air pressure in the drum, the drum speed and the pressure exerted on the work. For the best results, the grinding station should be equipped with an air outlet complete with pressure reducer, air hose and a nozzle-type air gun for inflating the drum. In the following examples, air pressures quoted refer to those in the hose, not at the drum.

For aggressive action with a 50-X band and a Model 320 drum, place the band on the drum and inflate to 50 to 60 psi. This should make the drum slightly convex in cross-section. The drum can be operated at maximum rpm at this pressure, and centrifugal force will increase the contouring. For a smoother finish, drop the pressure to 30 to 40 psi. Once the band has been formed, the drum will hold it with as little as 10 to 15 psi—a feature impossible with standard bands.

If a smoother, less aggressive action is needed with an 80-X band and 525 drum, for example, apply an initial pressure of 30 to 40 psi, then drop it to run at 20 to 25 psi. If a 50-X or 80-X band is used on a Model 620 drum, inflate first to 40 psi and operate at 20 to 25 psi.

In all cases, a more severe contour can be developed by wetting the backing of the bands before mounting them. This lets them stretch further; rotation soon dries them out. • • •

Grinding "Whodunits" require expert sleuthing

By RALPH N. S. MERRITT

Mr. Merritt, product safety engineer with Norton Company for 10 years, with a total of 35 years in abrasives, is secretary of the ASA committee concerned with the Safety Code. He was also chairman of the Grinding Wheel Institute safety committee for five years.

Every grinding wheel breakage contains elements of a "whodunit." If everyone is lucky, there is no victim, but this does not lessen the crime. It usually requires expert investigation to discover the culprit. And prompt, informed action to locate and correct the danger is vital to prevent further trouble and possible injury.

Too often, the importance of investigation of the cause of each and every wheel breakage is not recognized. This may be due to the lack of information on procedure. There also exists a tendency to accept an occasional wheel breakage as unavoidable, and to mount a new wheel without investigation. Such a risk of a subsequent accident is foolhardy and inexcusable.

Of course, it may be that no one in the plant is familiar with the American Standard Safety Code for Abrasive Wheels, or has the necessary experience to pinpoint the trouble.

In any case, the responsible supervisor or safety director should promptly stop the grinding operation. He should preserve all of the evidence involved, including all wheel pieces, blotter and bushing, as well as the grinding wheel equipment exactly as used at the time of the breakage. He should then be sure that no further grinding is done until he is satisfied that the cause of the breakage has been corrected.

"A grinding wheel does not break! **It is broken."** And when this happens, it is practically certain that some equipment or operating condition is the cause. The grinding wheel manufacturers have traditionally maintained such high standards of quality inspection and testing that wheel defects are rarely to blame.

These rigid safety standards are dictated by the American Standard Safety Code for the Use, Care and Protection of Abrasive Wheels (ASA B71-1956). Every wheel manufacturer complies with this universal code.

This same American Standard Safety Code also dictates safety regulations for grinding wheel operation. These rules include wheel selection, safe machine equipment, wheel mounting procedure and operator protection. The grinding wheel operator must carefully observe these safety regulations to maintain the high factor of safety built into the wheel. And the operator's superiors are responsible for his education, equipment and supervision to prevent accidents and injuries.

The grinding wheel manufacturers have long recognized and accepted a responsibility to provide specially trained experts to investigate such accidents. Every local wheel representative is on call for such service. After the evidence has been preserved, a telephone call will start a chain reaction to solve the problem.

The consultant is trained to read the evidence from the exhibits and witnesses and will usually locate the code violation causing the trouble. He knows from experience that the major abuses are excessive speed and improper wheel mounting, representing 75% of all breakages. He can usually deduce what abuse caused the breakage from the wheel fragmentation pattern. This deduction can be confirmed by his study of equipment, blotters, and the rest of the evidence.

He will then explain his diagnosis simply and conclusively by reference to the safety code. The plant supervisor and operator can see the logic of his solution and can proceed with safety and confidence.

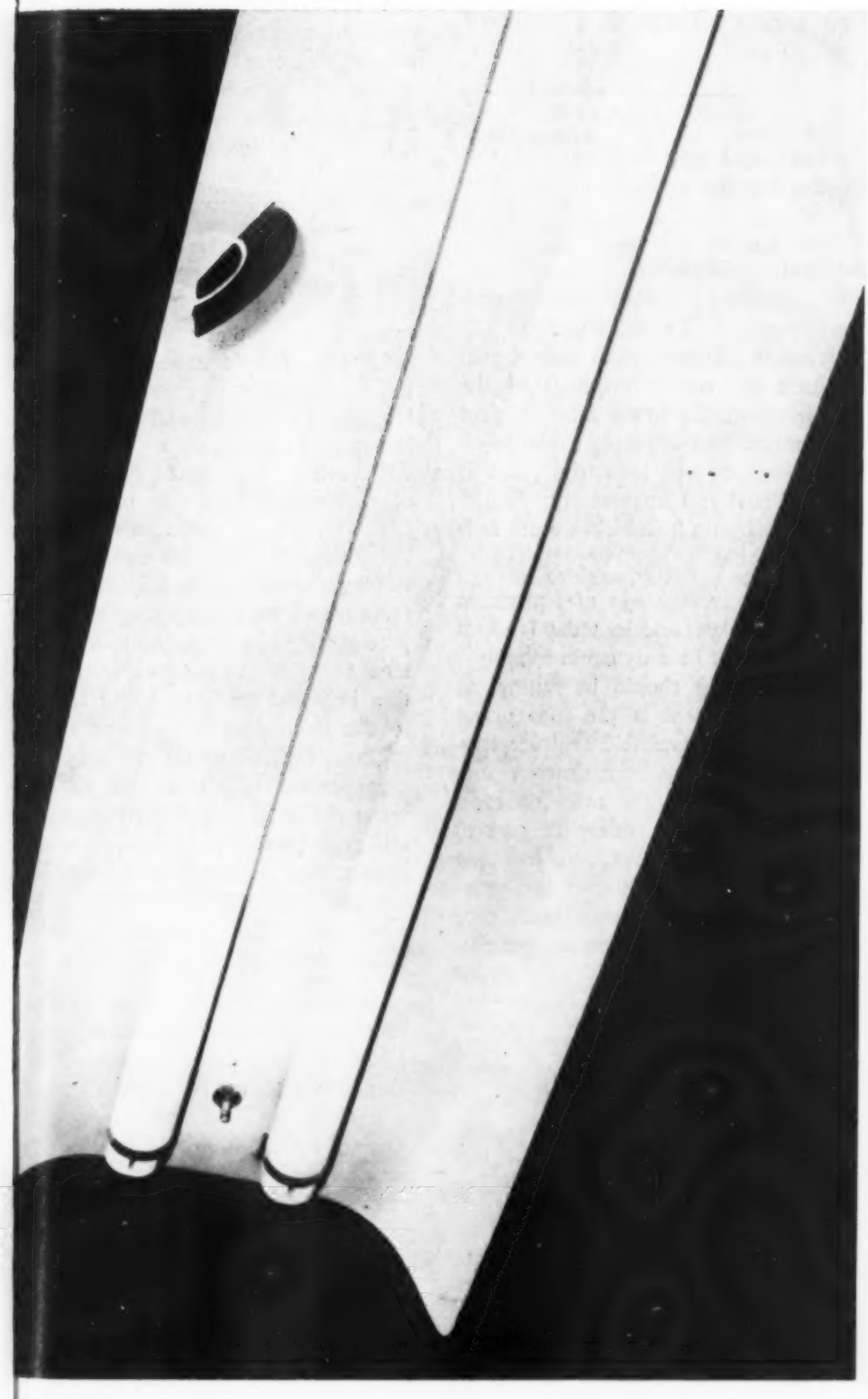
The whole procedure is so simple and sure that it is a pity it is not more generally used.

Of course, these same wheel suppliers' experts are available for safety education, **before** a breakage. A safety survey of the plant equipment and safety instruction for supervisors and operators will prevent accidents. Copies of the safety code and many safety pamphlets, films and posters are available for the asking. • • •

How did this piece of 6" cut-off wheel become imbedded in the metal reflector 14' above floor level? The manufacturer's recommended speed, plainly printed on the wheel, was 7,600 rpm. Someone mistakenly mounted it on a 12,000 rpm portable air grinder. Enough said! Fortunately, there were no injuries.

Three keys to investigation of wheel breakage:

- Stop the operation; leave everything in place.
- Get an expert investigator, preferably from maker.
- Correct the cause before resuming operations.



GRINDING WHEEL BREAKAGE SAFETY CHECK LIST

STOP

Leave evidence intact at "scene of crime."
Call safety investigator, preferably wheel maker's expert.
Preserve **all** wheel pieces, blotters, bushing, etc.
Preserve grinding machine intact as used at time of accident.
Check actual speed if variable or if machine is air driven.

INVESTIGATE

Safety investigator will determine factors of wheel selection, wheel mounting, details and condition of machine equipment and protection, and operating practice from exhibits if preserved as used. The more important factors he will investigate are:

1. Grinding Wheel
   a. Proper wheel selection
   b. Wheel inspection
2. Machine Equipment
   a. Spindle speed
   b. Mounting equipment
      Flange design and size
      Flange condition (if worn or sprung)
   c. Guards adequate
3. Wheel Mounting Procedure
   a. Free fit on spindle
   b. Clean blotters used
   c. Flanges carefully tightened
4. Evidence of Accidental Abuse
   a. Dropped wheel or equipment
   b. Damage from external sources
   c. Abusive pressure or other practice by operator.[1]

CORRECT

Safety investigator will compare the data revealed by exhibits and witnesses with regulations of the American Standards Safety Code and establish cause of breakage. Grinding can proceed safely after correction of conditions.

REFERENCES

[1]American Standard Safety Code for the Use, Care, and Protection of Abrasive Wheels, B7.1-1956. American Standards Association, Incorporated, 10 East 40th Street, New York 16, N.Y.

"I shall propose to the Congress a new tax incentive for business to expand their normal investments in plant and equipment" *

PRESIDENT JOHN F. KENNEDY

Modernization of plant facilities, replacement of productive equipment and capacity to produce are getting top priority and attention in Washington. The President showed a commendable awareness of three major problems which must be attacked if our country is to remain strong: economic growth, plant modernization and price stability.

Before a packed house, he expressed thoughts every business held dear, and which every businessman had been trumpeting for years. "Capacity operation is the key. No matter what other arguments or stimulants are used, the incentives for investing new capital to expand manufacturing plant and equipment are weak as long as manufacturers are operating at less than 80% of capacity. From 1950 to 1958 we put only one sixth of our total output into capital formation, while Japan, Germany, Italy, the Netherlands, Canada, and Sweden were all investing one fifth or more of their total output in capital goods. So it is not surprising that each of these and other nations over the past several years has surpassed us in average annual rate of economic growth."

In speaking of plant modernization the President said, "New plant investment not only means expansion of capacity; it means modernization as well. Gleaming new factories and headlines about automation have diverted our attention from an aging industrial plant. Obsolescence is slowing down our growth, handicapping our productivity, and worsening our competitive position abroad."

THE U.S. IS "FALLING BEHIND"

"Nothing can reverse our balance-of-payments deficit if American machinery and equipment cannot produce the newest products of the highest quality in the most efficient manner. The available evidence on the age of our industrial plant is unofficial and fragmentary; but the trend is unmistakable—we are falling behind.

"The average age of equipment in American factories today is about nine years. In a dynamic economy, that average should be falling, as new equipment is put into place. Instead, the available evidence suggests that it has been slowly rising. Private surveys of machine tools used by manufacturers of general industrial equipment found less than half of these tools over ten years old in 1949, but two thirds over that age in 1958. Nineteen per cent of our machine tools were found to be over twenty years old.

"Meanwhile, other countries have been lowering the average age of their fixed capital. The German example is the most spectacular: their proportion of capital equipment and plant under five years of age grew from one sixth of the total in 1948 to two fifths in 1957.

"All of these facts point in one direction: We must start now to provide additional stimulus to the modernization of America's industrial plant. Within the next few weeks, I shall propose to the Congress a new tax incentive for businesses to expand their normal investments in plant and equipment."

PRICE STABILITY AND INFLATION

The President realizes that the government is almost without "direct and enforceable powers over the central problem." He continued, "A free government in a free society has only a limited influence over prices and wages freely set and bargained for by free individuals and enterprises. And this is as it should be if we are to remain free.

"Nevertheless, the public interest in major wage and price determination is substantial. Ways must be found to bring that public interest before the parties concerned in a fair and orderly manner. For this reason, I have announced my determination to establish a Presidential Advisory Committee on labor-management policy, with members drawn from labor, management, and the public. I want this committee to play a major role in helping promote sound wage and price policies, productivity increases, and a betterment of America's competitive position in world markets. I will look to this committee to make an important contribution to labor-management relations, and to a wider understanding of their impact on price stability and economic health. And in this undertaking, I ask and urge the constructive cooperation of this organization and its members.

"Economic growth, plant modernization, price stability—these are all intangible and elusive goals. But they are all essential to your success, and to the success of our country. Initiative, innovation, and hard work will be required, on your part and on ours."

*President John F. Kennedy's address to the luncheon meeting of the National Industrial Conference Board, Washington, D. C., February 13, 1961.

Hone head lengthens tool, stone life

Field report indicates that a radical design change in honing tools has increased stone performance, doubled honing tool life, and provided for a far wider size range with more accuracy and size control.

Close-up of assembled hone head, showing wear plates between stones and the method of holding stones. Ends of expansion bars show most clearly under the stones at upper right and lower left.

● Reversible wear plates, a body designed to accommodate a number of sizes of expansion bars and wear plates, and the elimination of expansion pins are some of the advanced design changes in a honing tool developed by Mid-West Abrasive Company, Machine Tool Division, Owosso, Michigan.

Wear on any honing tool is likely to be greatest on the pressure side of the stone guide and stone holder. This condition requires repairing or rebuilding the tool, at approximately 60% to 80% of its original cost.

On the new Mid-West head, wear plates are removable and reversible. Since plates can be rotated 180°, wear is distributed between the two sides, and the life of the tool is consequently doubled. The life of the tool may be increased indefinitely by replacing the wear plates after both sides have been worn. Wear plates can be rotated or changed without taking the tool out of the machine.

Conventional honing heads are designed to operate over a diameter range of about one-half inch. The Mid-West hone head, however, has been designed to use a number of sizes of interchangeable expansion bars and wear plates. This means that a single hone body for a nominal diameter of 3″ can be used for diameters up to 5½″.

The larger the head, the wider the range.

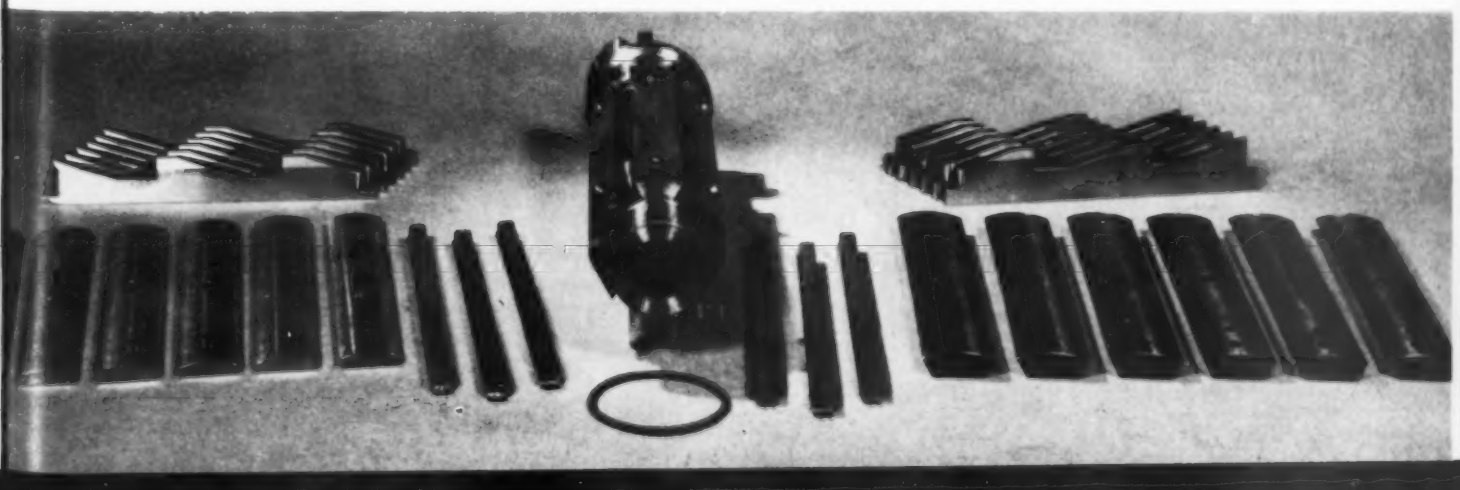
Added stone life is another advantage mentioned by a user in the Milwaukee area whose normal production rate is on the order of 1000 cylinders per week. One head basically uses a 7/16″ x 7/16″ x 8″ stone for 3½″ to 4″ diameters.

Each stone is mounted in a shell which is held by springs against an expansion bar whose width is .439/.440, in a slot .441/.442 wide. This support is credited for the greater life.

This user is able to hold closer end-to-end size with the new tool. The shop also reports that the Mid-West hone head has reduced the "squeal" in honing.

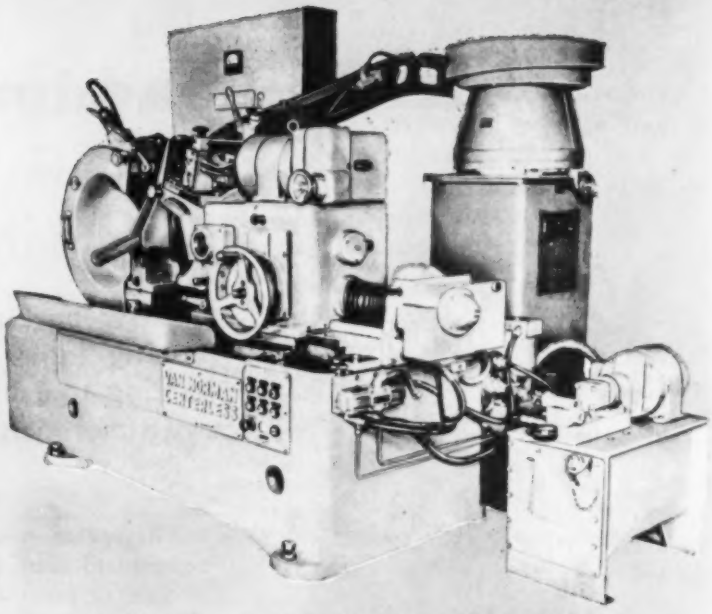
Results from their first Mid-West hone head have caused this shop to plan replacement of their conventional honing tools with the new design as new tools are needed. • • •

Hone body with a retainer spring and a single set of six stones is shown with two sets of wear plates and expansion bars, for two different nominal diameters. The head can be used with different plates and bars.

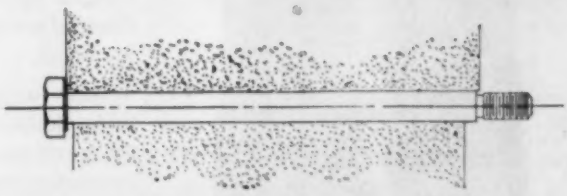


Centerless grinding bolts including shoulders

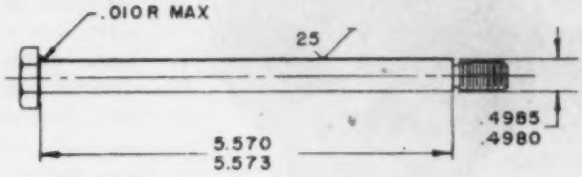
Only one machine was required to produce 515 finished bolts per hour to within .0005". Automatic feeding and dish face dressing provided the production and additional grinding of shoulder under head.



Van Norman 2-C Diversimatic Centerless Grinder with vibratory hopper and gravity-feed for automatic loading and unloading.



Drawing shows tolerances and finish required on centerless ground engine bolt.



Drawing shows the regulating wheel and grinding wheel arrangement for centerless grinding of bolt. Grinding wheel is dish dressed for grinding under bolt head.

● A sub-contractor for the auto industry was faced with the problem of increased production on engine bolts while maintaining quality finish and tolerances of within .0005". The bolt also required grinding of the shoulder under the head. Use of a Van Norman 2-C Diversimatic Centerless Grinder with a vibrator-type hopper and gravity-feed mechanism provided a maximum production of 515 parts per hour and removed .006-.008" of stock. The side of the grinding wheel is dish dressed and the regulating wheel is tilted 1° to provide wheel edge contact and in-feed pressure for grinding the shoulder.

PART:

Engine bolt, .4985/.4980" diameter, carbonized 1040 steel, Rockwell "C" 58-60, stock—.006" to .008".

PROBLEM:

Grind shaft to within .003" tolerance, bump grind shoulder under head, hold 25 microinch finish, maximum production 515 per hour, one operator.

PAST CONDITIONS:

Centerless grinder, hand loaded, lack of precision due to age and spindle rigidity.

SOLUTION:

Vibratory hopper to gravity feed on centerless. Infeed, grind, and ejection automatic. Dish dress side and diamond dress face of grinding wheel; 1° tilt regulating wheel for shoulder. • • •

Abrasive Engineer's Corner

ARTHUR RAKESTRAW • Contributing Editor

GENERAL PURPOSE WHEELS . . . DIAMONDS AND RMS FINISH . . . COSTS OF GRINDING CARBIDES

GENERAL PURPOSE vs. SPECIAL GRINDING WHEELS

• As a maintenance engineer, I am interested in knowing some of the benchmarks that indicate when it is feasible to change from all-purpose wheels to specific wheels for a given grinder.—J. W., Houston, Texas.

While the term "all-purpose" or "general-purpose" is used rather extensively in the grinding and finishing industry, opinions vary considerably as to what specifications might fit into this category, particularly for cylindrical grinding operations.

On the majority of installations such as bench and floor stands, the type of work is much the same in all industrial plants, and the specifications used are rather common.

The all-purpose specification is one that appears to do a satisfactory job on a variety of work in a given plant, though it might not be satisfactory in another.

Other than the finish requirements of the particular part and the operating characteristics of a particular specification, there is no benchmark or indicator that might suggest a change in the wheel.

If the so-called general-purpose wheel—or any other wheel for that matter—fails to produce the required results, finish, or grinding characteristics, then the introduction of a specification that will do so is indicated. Or if a skilled machine operator is unable to obtain the desired results with the available wheel specification, then a change is desirable.

EFFECT OF DIAMOND GRIT SIZE ON RMS FINISH?

• What rms finishes are attainable with diamond grit of various sizes in abrasive wheels?—F. S., Geneseo, New York.

Finishes produced by diamond wheel specifications are primarily the result of grit size, although they can be varied somewhat by the method of applying the work to the wheel face. Traversing the work across the diamond wheel face produces a better finish than a plunge cut with no traverse.

While we do not have information at hand covering the entire range of available diamond grit sizes, we believe that the following data could be safely projected to incorporate other grit sizes:

150 grit diamond—10 rms
320 " " — 5 rms.

"My husband had it installed. It scours and polishes pots and pans like magic."

SILICON CARBIDE, DIAMOND FOR GRINDING CARBIDE?

• What information can you give me on the comparative costs of silicon carbide and diamond wheels in grinding carbides—J. W., Detroit, Mich.

Because of the many different grades of tungsten carbides, each having different hardness and toughness characteristics, the answer would of necessity have to be rather general.

On roughing operations, which invariably involve the removal of shank material as well as carbide, green grit silicon carbide wheels are most economical. A fair average cost would be approximately $7.00 per cubic inch of material.

Because of the rapid and erratic wheel wear of green grit silicon carbide, it is seldom used on fixed feed finish grinding operations. The rapid wear precludes any possibility of obtaining uniform cutting edges and contours.

Here the diamond wheel because of its stability and uniform cutting is by far the more satisfactory. Grinding should be confined to the carbide only.

A good average cost would approximate $10.00 per cubic inch of material, although there are instances on special applications where the cost has been held as low as $3.50.

THE CORNER is a good place to share your problems, comments, and experience in abrasives and their uses. Send your questions or contributions to: A. S. Rakestraw, GRINDING and FINISHING, Wheaton, Ill.

Seal leakage reduced by blasting

After studying several other types of finishing, Vickers Inc. found they could greatly reduce their problem of seal leakage between shafts and rubber seals by finishing the shafts with an ultra-fine glass bead wet blasting process.

Operator loads shafts in the wet blasting enclosure in what is now a pilot operation. Automatic timing of the blast cycle and external loading are planned improvements.

A study conducted by Vickers Incorporated, Division of Sperry Rand Corporation, has shown that a discontinuous, non-directional finish deep enough to avoid being lapped smooth is a key factor in reducing shaft seal leakage. Further study proved the most suitable finish of this type is produced by a wet blasting technique using a powder-like material consisting of ultra-fine glass beads. The process also met the requirements of being fast, cheap, automatic and repeatable. Vickers engineers worked in co-operation with Wheelabrator Corporation in developing the application of this technique.

Seal leakage problems are a chronic headache in many industries. They range in severity from the annoying oil drippings under a parked car to a potentially more critical situation aboard a jet aircraft. Results can be costly in terms of lost fluid, damaged equipment or down time and with the trend to higher pressures and speeds, the problem is even more critical.

Problem:

How to finish shafts requiring seals so that the finish would be discontinuous, nondirectional and deep enough to hold lubricant but not be lapped out. Process must be fast, cheap, automatic and repeatable.

Alternatives:

Centerless plunge type grinding (previous process)
Light buffing
Burnishing
Copper—Chrome plating
Wet blasting

Evaluation:

Centerless plunge grinding was found to produce sharp edges which sliced the seals and the edges lapped smooth during wear. Spiral grooves in effect caused a pumping action forcing the fluid out from under the seal.

Light buffing was found too difficult to control. Excessive buffing created a surface too smooth to retain fluid for proper lubrication of seal.

Burnishing was used primarily to check pumping theory. Grooves were deliberately burnished into surface and seal leakage was greater.

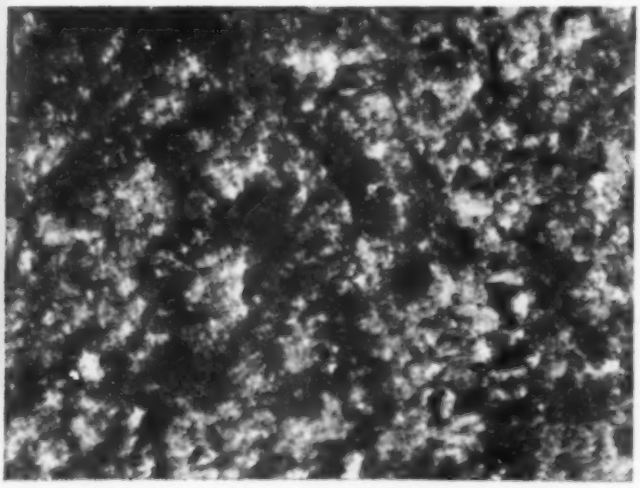
Copper-chrome plating was too costly. Bits of chrome picked up by seal lapped the surface too smooth.

Wet blasting was found to produce the best finish with a pattern of tiny pits forming a discontinuous and non-directional type surface. These small pockets trap the fluid and impede its travel past the seal. The pools of fluid are also believed to provide lubrication.

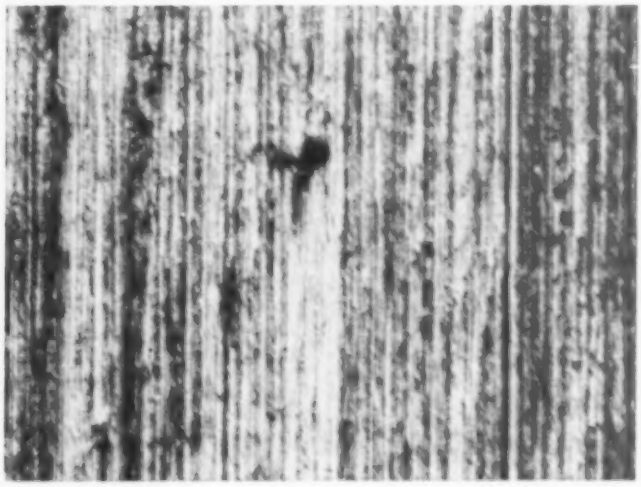
Solution:

A wet blasting machine was purchased from Lord Chemical Corporation. The machine is presently manually controlled and set up in a pilot line at the Jackson, Mississippi plant. Future machines will have outside loading and automatic timing of wet blasting cycle. Parts are fixtured vertically within an enclosed cabinet. Nozzle through which a mixture of tiny glass beads and water is sprayed moves up and down along the shaft. Shafts are ground with less rigid control than previously and then finished by wet blasting. • • •

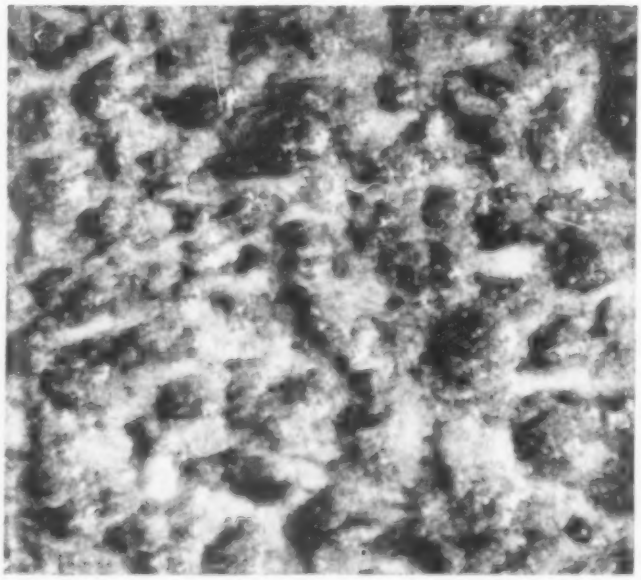
Shaft mounted on a rotating fixture inside the enclosure. A slurry of tiny glass beads and water is sprayed from the nozzle (right) onto the shaft in a rotating fixture.



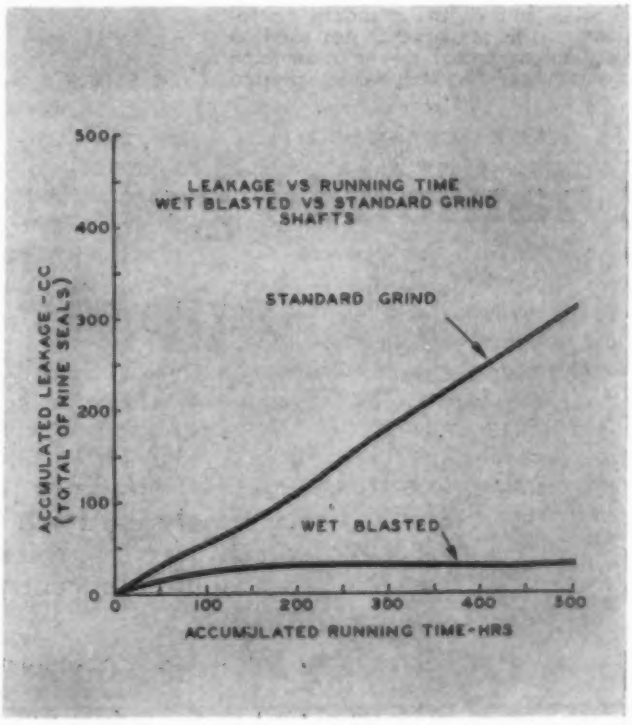
Enlarged view showing appearance of shaft surface after wet blasting with fine glass beads. Shot taken before running a seal on shaft. Note non-directional finish.

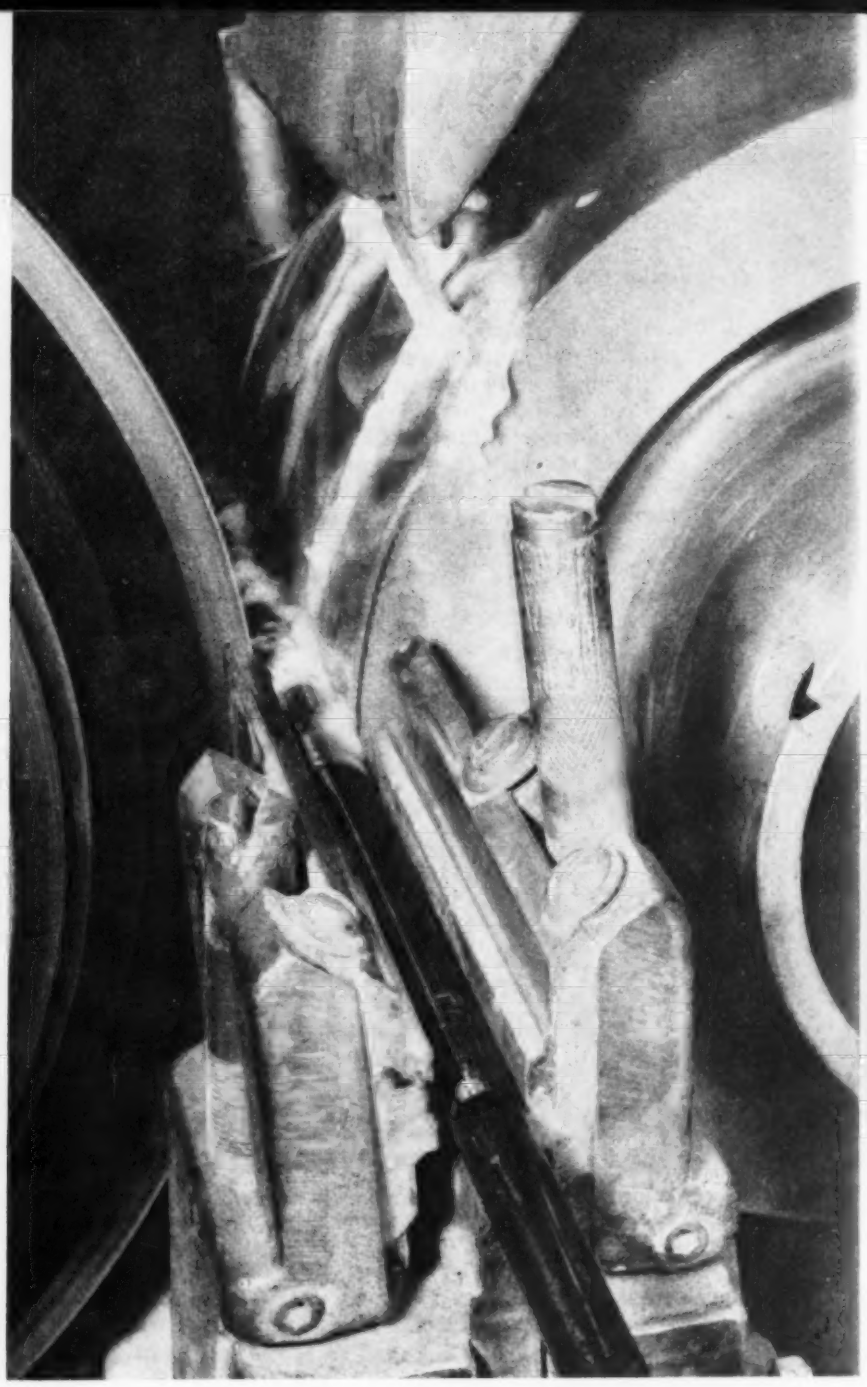


Microscopic view of typical ground shaft surface showing sharp knife edges which slice the rubber element. Also showing are spiral grooves which permit fluid leakage.



Wet blasted shaft surface after running with a seal. The surface has not been lapped smooth, as is frequently the case with ground surfaces. This means that the tiny, unconnected pits will continue to trap the fluid and provide lubrication for the rubber element plus reducing leakage.





A Cincinnati Centerless grinder equipped with a 17-inch diamond wheel is used at Duncan-Inglewood, Inc. for grinding thin rods of synthetic sapphire and quartz. The diamond dresser (to upper left of wheel), part of the standard equipment on this machine, is not used on the diamond wheel. Cover of machine was removed for the photograph.

Diamonds grind sapphire and quartz

Special to GRINDING and FINISHING

Extremely hard and brittle synthetic sapphire and quartz present a real problem when the material must be ground to absolute concentricity, zero taper and held to within "tenths."

One of the larger sized rods of synthetic sapphire is shown in a centerless grinder at Duncan-Inglewood, Inc. A diamond-faced wheel grinds the hard, brittle material to precise dimensions. Sapphire and quartz rods as small as .020 inch diameter are ground without breakage by the smooth cutting action of the diamond wheel.

A small, but complete grinding plant, located in Inglewood in the heart of Southern California's expanding electronics industry, specializes in grinding components required by the manufacturers of electronic devices. Men at Duncan-Inglewood, Inc., face daily the problem of grinding new materials to new designs with micro-tolerance specifications.

Recently they were asked to perform a grinding job for an electronics manufacturer which appeared impossible even to engineers accustomed to "impossible" assignments. It called for grinding several sizes of synthetic sapphire rods and quartz rods to absolute concentricity, zero taper, and to within .0002 inch of specified diameters.

Specifications for the smallest of these rods called for a length of seven inches and a diameter of .025 inch. Some rods required two diameters, such as a .040-inch diameter with a .020-inch nose. Tolerance for the diameters was plus or minus .0002 inch and for concentricity .0002 inch.

The extreme hardness and brittleness of quartz and sapphire ruled out conventional grinding methods. The Duncan-Inglewood people tried every type and grade of manufactured wheel. They finally obtained a Dia-Chrome diamond-coated grinding wheel, 17 inches in diameter, which they mounted on one of their standard Cincinnati centerless grinders. The wheel has a coating of small natural diamond grit bonded directly to the steel face.

The diamond-coated wheel solved the problem of grinding the fragile material. Rods are now being turned out on a production basis. The dimensions of the diamond wheel have held constant during months of grinding the hard rods, assuring positive repeat for production runs.

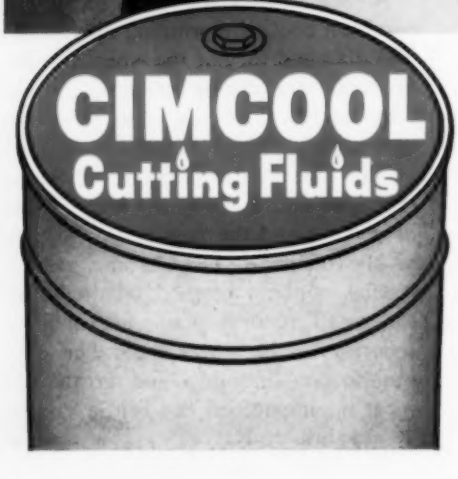
A heavy flow of water and oil emulsion cools the grinding operation. The diamond face of the wheel travels at 3000 sfm during grinding. Stock removal has been adequate in every operation.

The face of the diamond wheel is kept free and open by the heavy flow of coolant and the free cutting action of the diamond. Dia-Chrome uses a special bonding method which holds the small natural diamond particles securely to the wheel face. The diamonds cut smoothly and create almost no impact on the brittle quartz or sapphire rods. • • •

PRODUCTION JUMPED 466%

when CIMCOOL S2, the world's leading chemical cutting fluid, got on the job in Chicago.
(Company name on request.)

PRODUCTION REPORT
SALES REPORT
2.
and they make electrical components. The trouble they were having was in the high production milling of iron relay cores. They had only been able to turn out 120 cores per hour using straight cutting oil.
When we installed Cimcool S2 at a 1:20 dilution, the SFPM went from 120 to 330, and the feed increased from 2" per min. to 12" per min. As a result they increased production of the relay cores from 120 per hour to 680 per hour. That's a 466% jump!
In addition, they eliminated a de-greasing operation after milling. The machine was cleaner. Chips didn't stick to it. With Cimcool there was no smoke, no rust, no dermatitis and no rancidity
Bill Wolfenson
Chicago Office



FOR 100% OF ALL METAL CUTTING JOBS

Production-proved products of The Cincinnati Milling Machine Co.

CIMCOOL S2 Concentrate — The pink fluid which covers 85% of all metal cutting jobs.
CIMPERIAL° — Newest in the famous, industry-proven line of CIMCOOL° Cutting Fluids.
CIMPLUS — The transparent grinding fluid which provides exceptional rust control.
CIMCUT Concentrates (AA, NC, SS) — For every job requiring an oil-base cutting fluid.
ALSO — CIMCOOL Tapping Compound — CIMCOOL Bactericide — CIMCOOL Machine Cleaner.

For full information on the complete family of CIMCOOL Cutting Fluids, call your CIMCOOL Distributor. Or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.

°Trade Marks Reg. U. S. Pat. Off.

Use postpaid card. Circle No. 220

Grinding and Finishing

APRIL, 1961

(Not valid after June 30, 1961)

Tear out and mail this card!

Please send information on all items I have encircled:

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City ..... Zone..... State.....

Products Manufactured .....Appox. No. Plant Employees.....

Do you wish to continue to receive Grinding and Finishing? ☐ YES ☐ NO

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What article in this issue interested you most?_____

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These Reader Service Cards are for your convenience. They will assist you in getting the additional information you require about any editorial item or advertisement. Because of the speed with which thousands of cards are processed each month it is essential that the blanks be filled in accurately and completely. This will save time and speed the information to you.

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Grinding and Finishing

APRIL, 1961

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Please send information on all items I have encircled:

Your Name ..... Title.....

Company .....

Address .....

City ..... Zone..... State.....

Products Manufactured .....Approx. No. Plant Employees.....

Do you wish to continue to receive Grinding and Finishing? ☐ YES ☐ NO

ADVERTISEMENTS

201	202	203	204	205	206	207	208	209	210
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EDITORIAL

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Literature

Informative reading in abrasive operations for management, engineering, production.

Barrel Finishing

Use postpaid card. Circle No. 1

A completely revised edition of "Barrel Finishing" has been published by Norton Co. The 96-page booklet describes various barrel finishing processes, offers recommendations of the various abrasive shapes and sizes for applications in which they are best suited, gives case histories of actual uses, describes all types of finishing equipment available, discusses compounds and their effects, and includes a section devoted to practical suggestions on operation procedures. Form 501. Advertising Dept., Norton Co., Worcester 6, Mass.

(See Number 1)

Drill Grinder

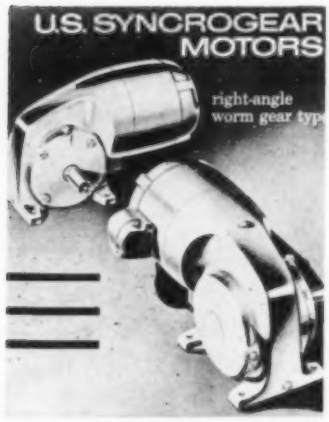
Use postpaid card. Circle No. 2

The Farrel-Sellers 4-G self-contained dry grinder for grinding drills up to 2" diameter is the subject of a 4-page illustrated brochure. Bulletin 4000-A. Farrel-Birmingham Company, Inc., Consolidated Machine Tool Division, 565 Blossom Road, Rochester 10, N.Y.

Right-Angle Worm Gear Motors

Use postpaid card. Circle No. 3

Right-angle worm gear types of U.S. Syncrogear Motors are presented in a new brochure containing technical data, feature illustrations, and descriptions. Shown are a number of specialized models and a number of optional mounting and assembly positions. Brochure No. F-1971. U.S. Electrical Motors Inc., P.O. Box 2058, Terminal Annex, Los Angeles 54, California.



(See Number 3)

Air Actuators

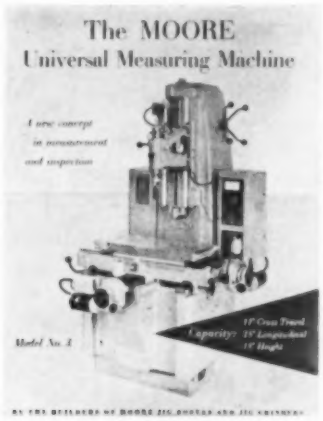
Use postpaid card. Circle No. 4

The various models and capacities of new Wil-Numat air actuators are presented in a 4-page circular. The actuators are for use on all hollow spindle machines and can be used to actuate either push or pull collets, expanding mandrels, rubberflex collets or power chucks. Wil-Numat Corp., 411 South Hindry, Inglewood 1, Calif.

Measuring Machine

Use postpaid card. Circle No. 5

The recently-developed Moore Universal Measuring Machine is depicted in a 4-page folder which discusses uses, adaptations, and versatility of the unit for measurement and inspection. Moore Special Tool Co., 800 Union Ave., Bridgeport 7, Connecticut.



(See Number 5)

Do's and Don'ts of Grinding

Use postpaid card. Circle No. 6

Ten grinding do's and don'ts are listed on a 13½" x 13½" wall chart suitable for display on bulletin boards and in grinding machine areas. Chart furnishes information based on regulations established by the American Standard Safety Code for The Use, Care and Protection of Abrasive Wheels, B7.1-1956. Grinding Wheel Institute, Cleveland, Ohio.

Throwaway Grinder

Use postpaid card. Circle No. 7

Any type tool such as triangles, squares, diamond shapes, hexagons, pentagons, rounds, and rectangles can be ground on the Harvel Throwaway Grinder. A 4-page bulletin describes the machine's action and uses. Harvel Machine Co., 618 East Ten Mile Road, Hazel Park, Mich.

Relief-Grinding Fixture

Use postpaid card. Circle No. 8

The Harig Steptool Relief-Grinding Fixture is the subject of a 4-page bulletin which shows how the fixture can be used to grind any type of drill and do cam-relief grinding on an endless variety of tools. Also described are the infinite cam adjustments, how to locate tools in the fixture, grinding flutes, Helixpoints . . . setups for sharpening taps, and piloted countersinks. Harig Mfg. Corp., 5757 West Howard Street, Chicago 48, Ill.

(See Number 8)

FREE LITERATURE *continued*

Rotor Tools

Six-page Bulletin SG contains complete specifications for the Rotor Tool Company's D-4 standard 4-inch and light duty 6-inch grinders and buffers, the D-6 standard 6-inch and light duty 8-inch grinders and buffers and the D-8 series of heavy duty 8-inch units equipped with internal blade motors. Rotor Tool Co., 26300 Lakeland Boulevard, Cleveland, Ohio.

Use postpaid card. Circle No. 9

Jigs and Fixtures

The jig and fixture industry's most complete line of clamps and components are illustrated in a 20-page catalogue published by Morton Machine Works Division of Brubaker Tool Corp. More than 1,300 sizes of 75 standard items are listed with prices. Morton Machine Works Division, Brubaker Tool Corp., P.O. Box 231, Millersburg, Pa.

Use postpaid card. Circle No. 10

Gage Modifications

"Ideas," an 84-page booklet, shows how standard Boice gage components can be incorporated in special and unusual gaging assemblies. Simple solutions to many common gaging problems are illustrated. Boice Gages, Inc., Hyde Park, New York.

Use postpaid card. Circle No. 11

Crushtrue Process

The Crushtrue method for forming and dressing grinding wheels and the production of cylindrical and flat forms is presented in a 12-page catalogue, No. CR-355-5M. Art and photographs illustrate the phases of the process. Machine Tool Division, Sheffield Corp., Dayton 1, Ohio.

Use postpaid card. Circle No. 12

Fiber-backed Abrasive Discs

Types and uses of Carborundum Company's new fiber-backed abrasive discs are discussed in a 4-page folder. Advertising Branch, the Carborundum Company, P.O. Box 337, Niagara Falls, N.Y.

Use postpaid card. Circle No. 13

Cylindrical Grinders

The precision cylindrical grinders manufactured by the Landis Tool Co. are illustrated and described in a new 8-page condensed general catalogue. Bulletin CG-60. Landis Tool Co., Waynesboro, Pa.

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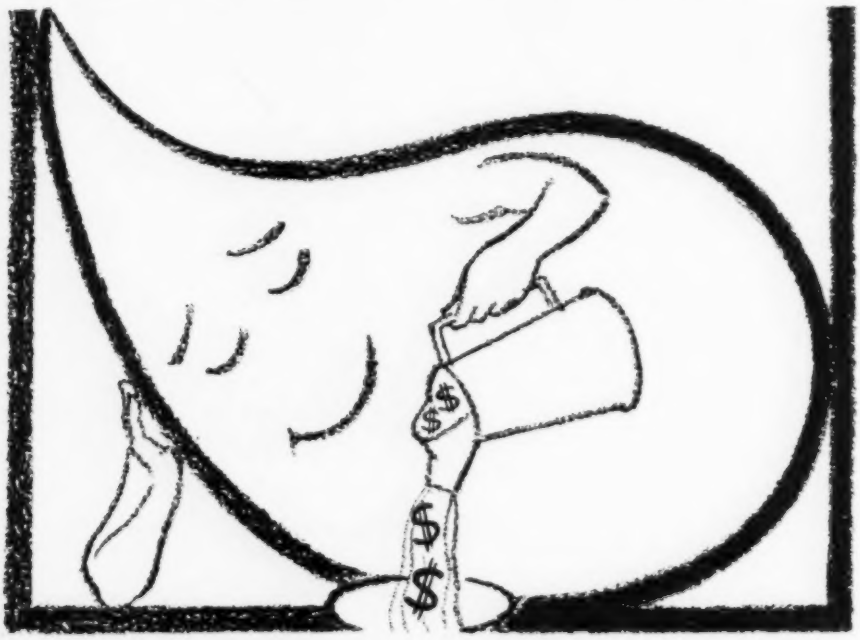


Is a lazy coolant pouring your profits down the drain?

Do you have to change your grinding coolant too frequently? Does it become rancid quickly — fail to keep the wheel open or settle chips properly?

Are you getting poorer finishes, lower stock removal and less wheel life than you think you should?

If so, switch to White & Bagley *lively* coolants. There's not a tired ounce in a tankful!

For about 1¢ a gallon coolant cost, use W&B Chemical Concentrate 1500 for grinding steel. W&B E-55 is recommended for steel, cast iron and nonferrous metals. Both concentrates give extremely keen grinding action.

For grinding AND cutting, use W&B Lubricant 1888 — a high detergent, oil-type, water soluble concentrate for better finishes.

For very tough grinding and cutting jobs, W&B HD Soluble Oil 2213 (heavy duty) provides extra lubricity, exceptional support for the cutting tool or grinding wheel.

For critical thread, gear, tap and form grinding, W&B Grinding Oil 1572 is the standard of the industry.

Write for facts about cost-saving coolants to: The White & Bagley Co., 88 Foster St., Worcester, Mass.

THE WHITE & BAGLEY CO.

Worcester, Massachusetts · Detroit, Michigan

Originators of Grinding Lubricants

Use postpaid card. Circle No. 222

"I said, 'These grinding wheels are generating too much heat!' "

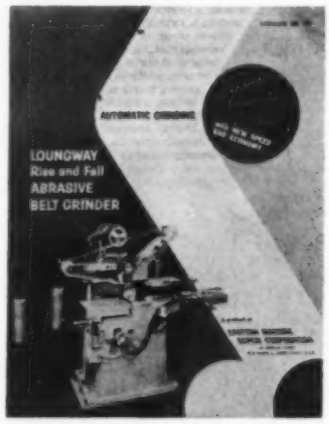
Length and Depth Gages

A new two-page bulletin on depth gages and adjustable length gages is available from the Unigage Corporation. The adjustable length gage is designed to handle a wide range of measurements. The depth gages are for small hole use and routine depth measurement. Unigage Corp., 330 Interstate Road, Addison, Ill.

Use postpaid card. Circle No. 15

Belt Grinder

Catalog No. 100 contains details on the Loungeway Rise and Fall Abrasive Belt Grinder, featuring a floating piston for belt tension, adjustments for belt alignment and tracking, and its unique cam operating air-powered table speed indexing. Eastern Machine Screw Corp., New Haven 6, Conn.



Use postpaid card. Circle No. 16

Cutting Fluids and Lubricants

Twenty-six different types of cutting fluids and lubricants are covered in Shear-Speed's new 52-page catalogue. Soluble concentrates are discussed in three sections. More specialized oils are covered in other sections. Shear-Speed Chemical Products Division, Michigan Tool Co., 7125 East McNichols Road, Detroit 12, Mich.

Use postpaid card. Circle No. 17

"Remember this, you guys! We gotta have those grinding wheels back in the morning"!

Save up to 50% on grinding time . . . up to 50% on abrasive costs!

Take an AA1 chuck, load it up with FM quick-change segments, and you've got a cost-cutting, production-boosting combination that can give you **amazing** results . . . like these reported by present users: "AA1 chucks and segments doing a 150% faster job with no loading, no dressing. Segment life is 2½ **days** per set as against 4 to 5 **hours** previously." "Saving 30% in direct labor and 35% in abrasive costs. More accurate grinding due to cooler cutting and less distortion." "Saving $16 a day on segments, yet getting better quality, faster production, with AA1-FM." "70% reduction in inventory due to one FM segment shape and size for wide variety of machines."

Here's the secret: **exclusive** circular echelon arrangement and novel segment design produce much faster cutting; throw off chips and grinding residue. AA1 design and FM segment shape give you lowest cost per cu. in. of usable abrasive.

Lots more, too. See for yourself how the mighty FM-AA1 combo cuts your costs . . . pays for itself in no time. Give it a whirl. Write today!

For practically all Surface and Face Grinders!

FM THE FULLER MERRIAM COMPANY 72 Water St. West Haven, Conn. Telephone WEst 3-2501

LITERATURE ON REQUEST.

A GUIDE TO GRINDING WHEEL SELECTION is available on request.

Use postpaid card. Circle No. 223

FREE LITERATURE *continued*

Electrolytic Drill Sharpener

Relative combinations of point angle, lip relief angle, and helix angle to solve all metal cutting needs are made possible by the new Ampak Electrolytic High Speed Steel Drill Sharpener. The 4-page folder describes the features and capabilities of the Ampak. Connecticut Special Machine, Inc., Bridge Street, Winsted, Connecticut.

Use postpaid card. Circle No. 18

Blast Cleaning Barrels

Five heavy duty Rotoblast barrels, with work capacities ranging from 15 to 105 cubic feet, are described in this 16-page bulletin. Features of the Rotoblast process are illustrated with cutaway drawings, photos, and sketches. Bulletin 705. Pangborn Corporation, Hagerstown, Maryland.

Use postpaid card. Circle No. 19

Automatic Polishers

This folder illustrates and describes eight Packermatic polishing, buffing, and deburring machines. The Packer Machine Co., 456 Center Street, Meriden, Conn.

Use postpaid card. Circle No. 20

100 lbs. of motor...

216 lbs. of man...

New B & S Magnetic Chuck holds both, with ease!

If you want a magnetic chuck with tremendous holding power — this is it!

Brown & Sharpe's new rotary permanent magnet chuck gives you a big new grip, so strong that this chuck can be used for turning and other substantial cutting operations — as well as for grinding and polishing work.

Ask your Brown & Sharpe distributor for a "personal magnetism demonstration!" Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

▶ "Standing test" dramatizes power of new Brown & Sharpe chuck to hold heavy work. Motor frame is two feet long, with only about 7½ sq. inches of its end surface contacting the chuck. Job shown is grinding operation on both ends. Tolerance: .0002" overall.

Brown & Sharpe PRECISION CENTER

Use postpaid card. Circle No. 224

Mounted Wheels

Eighty-eight Chicago mounted wheels are pictured in four-page folder. Dimensions and prices for vitrified and resinoid, accompany each illustration. Bulletin 150. Chicago Wheel and Manufacturing Co., 1101 West Monroe Street, Chicago 7, Ill.

Use postpaid card. Circle No. 21

Air Filtering

Recent developments and uses of air filtering equipment are discussed in the American Air Filter Company's latest external newspaper. Page six of the publication is different for each of five marketing regions. Harry C. Gans, Editor, American Air Facts, American Air Filter Co., Inc., 215 Central Avenue, Louisville 8, Ky.

Use postpaid card. Circle No. 22

Universal Tools

Catalogue 1161CJ describes all Universal Vise and Tool Company's tools, including the new Universal Speedi-Spacer and "B" Series clamps. Universal Vise and Tool Co., Parma, Mich.

Use postpaid card. Circle No. 23

Cutter and Tool Grinders

The Grand Rapids No. 10 Motor Driven Universal Cutter and Tool Grinder and the No. 12 Plain Cutter and Reamer Cutter are the subjects of a 12-page bulletin. Equipment and uses are also described. Bulletin GL-5-59. Gallmeyer and Livingston Co., Grand Rapids 2, Mich.

Use postpaid card. Circle No. 24

Jig and Fixture Standards

A 4-page folder entitled "How 80% of American Companies Can Save Tooling Costs" is the result of a recent survey on jig and fixture design and building practices. Jergens Tool Specialty Co., 712 East 163rd Street, Cleveland, Ohio.

Use postpaid card. Circle No. 25

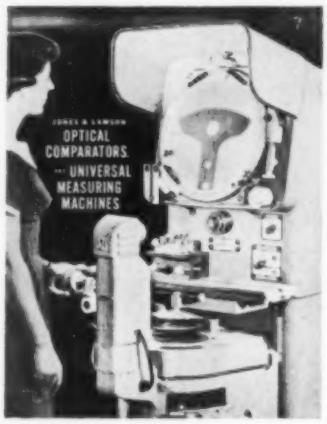
Metal Cutting Bibliography

A 1,000-page metal cutting bibliography containing abstracts of literature on chip producing processes has been produced by the American Society of Tool and Manufacturing

Engineers. A 19-page author index and a 163-page subject index are included. The book will be available September 15 at a cost of $20. ASTME Research Fund, 10700 Puritan Ave., Detroit 38, Mich.

Optical Comparators

Containing complete catalogue information on Jones & Lamson Optical Comparators, this 60-page book also provides details on accessories and illustrates over 20 applications. Included are complete specifications of all models. Catalog 6013. Jones and Lamson Machine Company, Springfield, Vermont.

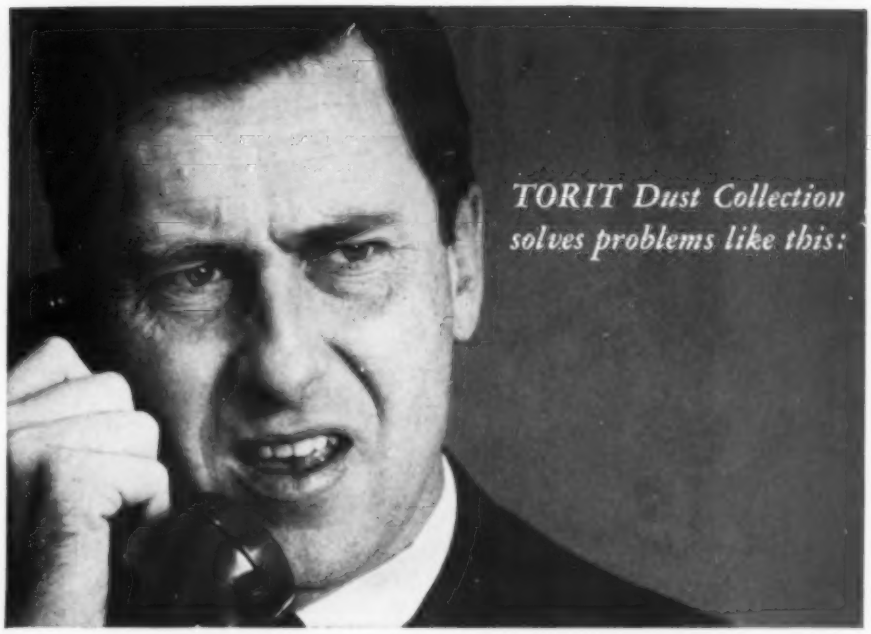


Use postpaid card. Circle No. 26

Safety Training Course

The National Safety Council's safety training course for industrial foremen consists of a series of six text booklets entitled "Men and Motives in Safety Supervision," and a manual for discussion group leaders. Each text booklet is for a one-hour training session for foremen. The leader's manual tells how to set up meetings and apply the material to individual plant situations. Cost: $2 a single set, including leaders' manual and $1.25 per set when 10 or more are ordered. National Safety Council, 425 North Michigan Avenue, Chicago 11, Ill.

"Meet Joseph Little, foreman in charge of small parts grinding."



"6 MEN OUT AGAIN TODAY?" "WHY?"

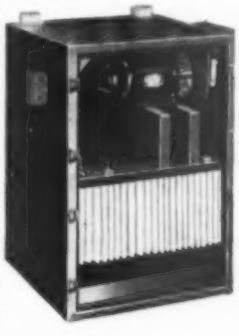
"I was on the receiving end of that question. And I knew what the boss was driving at. Production-wise, we couldn't stand our current rate of absenteeism. Even the men on the job were dragging their feet. To show you what I mean: we had just lost one of our best customers. Reason: one too many late shipments.

"Logically, when sickness strikes, you consult a doctor. Which is what I did. Without actual examinations, he couldn't diagnose the trouble. But he did give me the clue when he asked, 'How are your working conditions?'.

"Frankly, our plant is dirty. Or better put, dusty. With grinding machines running 24 hours a day, how could it be anything else? With that thought, I remembered. A salesman had been in my office just the other day talking about dust. I had too many production headaches at the time to hear him out. But I kept his card. So I called him back.

"He was from Torit. He was selling Torit Dust Collectors . . . machines that trap dust. When I compared the low cost of his equipment with the high cost of our production lag, I decided it was worth a try. So I bought one . . . just one, to start, for $285.00. We installed it ourselves on a key machine.

"The change in the man operating that machine sold me. Within a month, we had a Torit Dust Collector system attached to seventeen dust-producing machines in the plant. As a result, the air in our plant is clean, the way it should be. Our absentee rate is no longer a problem. Our production rate is at top speed. And you know something? I feel better myself!"



Is dust doing you *dirt? For complete facts on dust damage . . . and how to control it . . . write:*

TORIT manufacturing company

Dept. 524 1133 Rankin St., St. Paul 16, Minnesota

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The Pangborn Vibratory Finishing Machine

THE LONGER YOU OWN IT, THE MORE USEFUL IT IS!

"Every day we find new pieces it can finish," comes the word from the large, Midwestern die-casting firm shown above. And no wonder!

This machine makes itself useful in many ways: cleaning, descaling, radiusing, fine-finishing, burnishing or coloring. It can do all this with metals, alloys, many types of plastic and ceramic parts . . . and at speeds up to 100 times faster than conventional methods. It cleans the intricate or shielded surfaces you can't reach with barrel finishing or other means.

Available in many sizes, the Pangborn Vibratory Finishing Machine is the most compact unit in its field. Its standard equipment includes variable speeds and an exclusive air-cushioned suspension which assures automatic leveling and amplitude control. Auxiliary equipment, media and compounds available for every need.

Send parts with exact finish specifications or finished specimen, for sample processing in our laboratory to: Mr. William E. Brandt, PANGBORN CORPORATION, 820 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Dust Control, Blast Cleaning and Vibratory Finishing Equipment—Rotoblast® Steel Shot and Grit.®*

Pangborn

OF HAGERSTOWN

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SETTING TAPER ON A UNIVERSAL GRINDER

By H. J. Gerber

We often make use of a precision master taper bar to set the table of our universal cylindrical grinder.

This process is highly precise if several elementary precautions are considered in the setting up of the master and the dial test indicator which is used to verify the table setting.

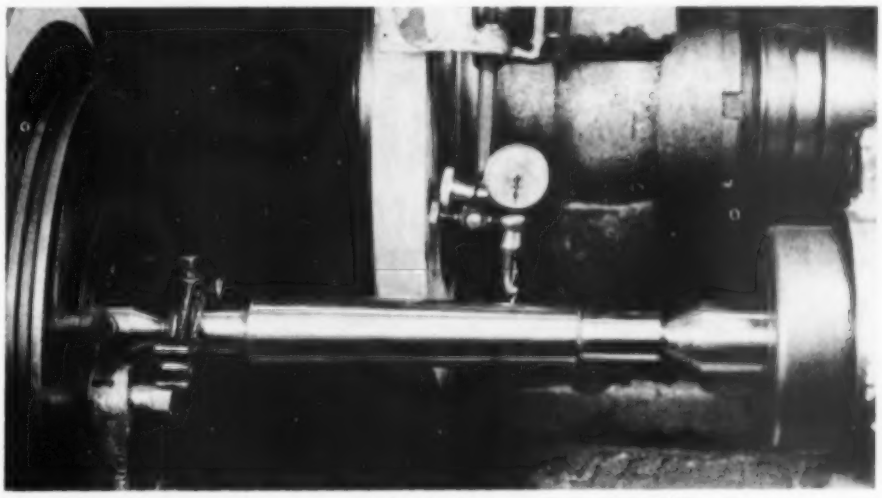
The master taper must, of course, be accurate. It must also have precision lapped center holes and be seated on the grinder centers with no obstruction, even thick oil, between centers and center holes. The dial indicator, which is secured to any convenient location on the wheel head, must contact the master exactly on the horizontal plane of its axis.

To accomplish the latter condition we make use of a test indicator with a spherical contact point of known diameter. This contact ball is set in correct position vertically by use of a toolmaker's height gage which is seated on the table of the machine. The height gage is set to the known height of the head and tail center axis minus one half the diameter of the ball contact.

Once the ball is set in this location the rest is simple: It is merely a matter of traversing the master past the indicator and adjusting the table setting until there is a zero reading on the indicator through the entire length of the master.

If this method is followed carefully there will be no difficulty in making exact duplicates of the master. We have found that the method eliminates the usual trial-and-error adjustments which are usually necessary in set-ups of this kind.

Setting the contact point on the dial indicator.



Traversing the master taper past the indicator to set the table on a universal cylindrical grinder.

HANDLE GAGE BLOCKS WITH CARE

• Two important tools included in the maintenance kit furnished with the DoAll gage block sets are insulated forceps and a camel's hair brush.

Handling the gage blocks with forceps minimizes heat transfer.

The brush is used to wipe off dust and lint before wringing blocks together or assembling them into functional gages.

(Photo—The DoAll Company)

Almost everyone has a centerless grinding operation. For every grinding set-up there is always the perfect wheel. Have you tried a Mid-West Abrasive resinoid bonded wheel on your centerless operation? Mid-West can and will prove the cost-cutting features of our centerless wheels by an actual shop demonstration.

A PERFECT WHEEL FOR EVERY OPERATION

RESINOID WHEELS FOR YOUR CENTERLESS OPERATION

FIVE REASONS WHY . . .

1. Greater amount of stock removal per pass than with vitrified bonded wheels.
2. Better finish for grit size of abrasive used without lowering rate of feed.
3. Cooler cutting and less danger of burning or checking parts ground.
4. Less down-time because of amount of dressing required.
5. Total overall reduction in cost per piece ground even though the initial wheel cost is higher.

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6129 North Tuxedo Street
CLifford 5-0106

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MADISON HEIGHTS, MICHIGAN
LIncoln 8-2440
JOrdan 6-3864

HIGH POINT, NORTH CAROLINA
1938 Green Street
Phone 5091

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24230 Miles Road
AXminister 2-7250

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PHILADELPHIA BRANCH
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ERLTON, DELA. TWP., NEW JERSEY
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ERLTON, NOrmandy 5-1232

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DETROIT PRESENTS INDUSTRIAL DIAMOND PROGRAM

A number of members and guests at Detroit's first dinner meeting of 1961 lend an ear to a joint discussion of industrial diamonds.

Arthur Kohlstrunk

R. S. Fowler, vice chairman of the board; **D. L. Wallace,** vice president in charge of manufacturing, and **Arthur Kohlstrunk,** chief engineer, Wheel Trueing Tool Company, Detroit, presented a program on industrial diamond applications for the February 23 meeting of the Detroit chapter. Eighty-one members and guests dined and listened at the Warren Valley Golf Club, Dearborn, Michigan.

In addition to the normal diamond uses and abuses, details concerning Tru-Grit rotary diamond dressing wheels were presented. Slides illustrated the various applications, tolerances and configurations.

CLEVELAND TREASURER TALKS BALL BEARINGS

Therell L. Sipe, abrasive engineer with GMC's New Departure Division, Sandusky, Ohio, and treasurer of the Cleveland chapter, discussed "Abrasive Applications in the Manufacture of Ball Bearings" with 41 hardy members and guests of that chapter at their March meeting.

This attendance was considered good, considering the late winter snow and ice storm that hit the city the afternoon of the meeting.

CHICAGO REVIEWS BASIC COATED ABRASIVES

Douglas E. Miller, new methods and development engineer, Minnesota Mining and Manufacturing Company, St. Paul, Minnesota, discussed fundamentals and industrial applications of coated abrasives with some 65 members and guests of the Chicago chapter at their March 9 meeting.

The talk included a review of the components of coated abrasives, the types of abrasive belt machining, and factors affecting performance.

Two films, "Production for Finish," and "Challenge for Steel," completed the program.

The next meeting (April 13) is a discussion of the properties of abrasive grain. For May, the subject is the cleaning of grinding and finishing coolants.

CONNECTICUT: PROGRESS IN MOUNTED POINTS

"Advancements in the Use and Standardization of Mounted Points" was the topic for **M. B. Perkins,** sales promotion engineer, Cortland Grinding Wheels Corporation, Chester, Mass., at the February 27 meeting of the Connecticut chapter.

Wider applications, progress in elimination of special types and sizes, and safety were some of the main points for discussion.

A wide assortment of mounted points and extremely small bearings with bores ground by such points evoked keen interest and many questions.

The April meeting will combine the annual meeting with the program on barrel finishing which was postponed from December.

The speaker for Sports Night in May will be **Steve Witkowski,** head trainer for the 1960 Olympic athletes.

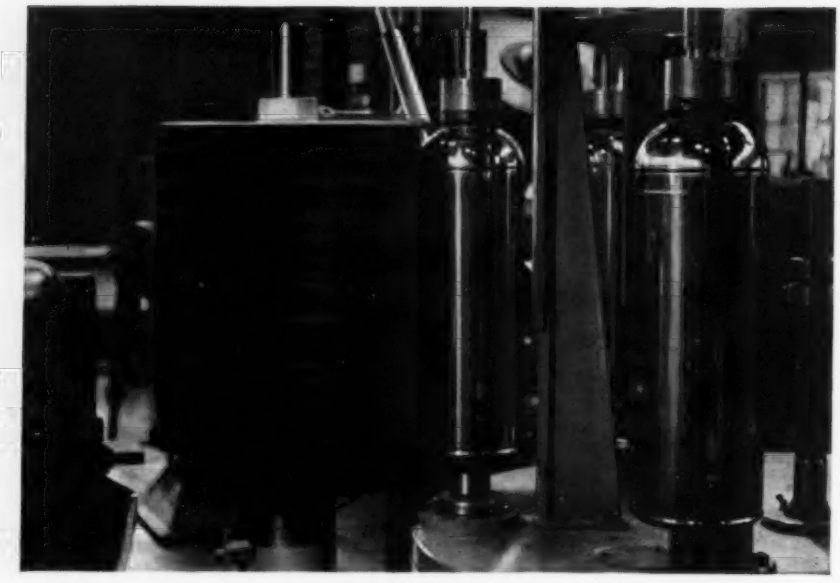
SAGINAW VALLEY HEARS VENTILATION ENGINEER

James C. Barrett, ventilation engineer with the Michigan State Division Occupational Health, talked concerning proper ventilation and dust control at the March 1 meeting of Saginaw Valley chapter No. 11. The group met at Naismyth's Restaurant, south of Saginaw, with 20 members and guests in attendance.

Barrett was assisted by **Russell Scovill,** district representative of the Division. A movie, slides and charts were used during the presentation.

continued

ACME IN ACTION



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Movement and Motion

Ever see an Acme automatic polishing and buffing machine in action? If not, you ought to—the sooner the better. It's bound to give you some new ideas about the versatility of mechanical movements and motions. Progressive ideas, too, about how they can be applied to do more work—better and faster—in finishing every conceivable type of part. Large or small—simple or complex. Drawn, spun, extruded—die-cast, forged or machined. Yes, you name it and Acme engineers will quickly demonstrate the kind of action required to improve quality and reduce your finishing costs. Why not send samples of your "problem" parts today for analysis and recommendations? No cost, no obligation.

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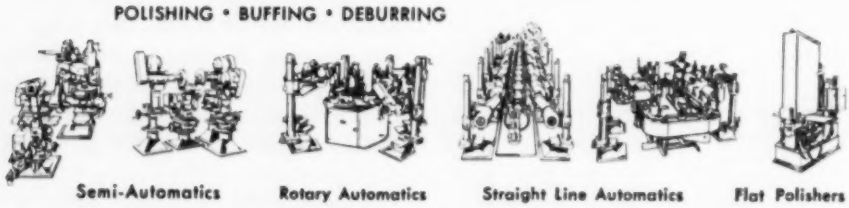

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POWER BRUSHING SUBJECT FOR WESTERN MASS.

"Finishing with Power Brushes" attracted 33 members and guests of Western Massachusetts chapter No. 10 to their meeting at Collegian Court, Chicopee, Mass., on Feb. 20.

E. P. Fisher of the Osborn Manufacturing Co. was the speaker.

After an introduction explaining how power brushes work. Fisher discussed the four major areas of applications: removing burrs, producing radii, improving microinch finishes, and cleaning.

Slides supplemented the talk, and a question-and-answer period with general participation completed the evening.

LONG ISLAND SCHEDULES CHEM MILLING PANEL

Joseph Kincaid and **Lewis Golden** of Grumman Aircraft Engineering Corp. were scheduled for a joint consideration of chem milling before the Long Island chapter's March meeting.

Kincaid, for 15 years a tool and methods engineer in the aircraft industry, is concerned with the development of tools and methods of application for the process. Golden's primary interest has been research and development in its uses for steel and aluminum.

SNOW "WHITES OUT" THREE EAST COAST MEETINGS

Jack Frost and Old Man Winter have teamed up to eliminate three ASA chapter meetings so far this winter.

Connecticut's December session and February meetings for both the Long-Island and the New Jersey chapters were canceled because of an excess of white stuff.

Chicago chapter members, recalling last winter's rough "ASA weather," extend sympathy.

MUELLER TALKS SYSTEMS APPROACH AT NEW JERSEY

"The Theory of the Grinding Systems Approach" attracted 45 members and guests to New Jersey's January 18 meeting at the Blue Shutter Inn, Union, New Jersey.

John A. Mueller, manager of the Carborundum Company's grinding and testing laboratory in the Bonded Abrasives division, was the speaker.

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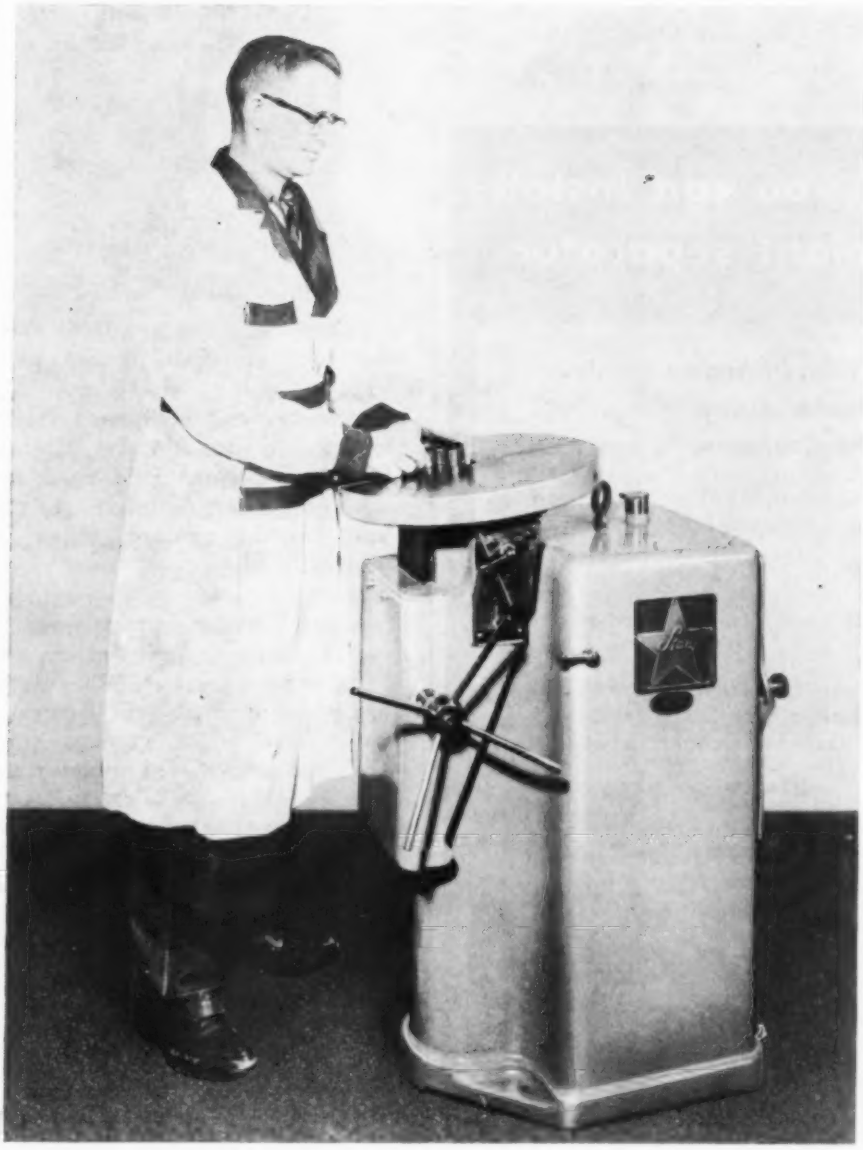
PROFILE UNIT GRINDS, POLISHES CONTOUR SHAPES



A floor-type, tilting-table profile grinder that accurately grinds and polishes contours and irregular shapes is suited to work in tool and die shops, toolrooms, and low production operations.

The machine has a grinding wheel mounted on a vertical reciprocating spindle. The grinder, Star No. 3, has wheel speeds of 4,500, 6,500 and 10,150 rpm.

Total wheel reciprocation is 3/16", and it makes 90 reciprocations per minute. Height of the table is from 38 to 44 inches.

The machine is sold complete with two table center plates, a diamond dresser with diamond-mounted nib, two cup wheel arbors, three socket wrenches, seven mounted pencil grinding wheels from 3/8" to 3" diameter, and a 4" diameter cup type grinding wheel with arbor hole.

Star Cutter Co., P.O. Box 376, 34500 Grand River Avenue, Farmington, Mich.

Use postpaid card. Circle No. 83

PEDESTAL BELT GRINDER ADJUSTABLE EIGHT WAYS

A new heavy duty abrasive pedestal belt grinder features an 8-way adjustable work table that adjusts for angular or compound angular application.

The table raises, lowers, and tilts right, left, up or down, can be brought close to the belt or platten or can be retracted.

The machine is equipped with a 3 hp motor, an automatic belt tension head, and a quick release for easy belt change. Roller, flat, or contoured plattens are available.

The abrasive belt capacity is 5" x 132. Belt speeds up to 1200 to 3800 sfm as desired in wet or dry application.

Bush Mfg. Co., 900 Rochester Road, Clawson, Mich.

Use postpaid card. Circle No. 84

LIQUID COMPOSITION ADDS WHEEL, BELT, DISC LIFE

A liquid abrading composition for grinding wheels, belts, discs, and set-up wheels has been designed for use in polishing and grinding of ferrous and non-ferrous metals and their alloys.

The liquid thoroughly coats the abrasive, completely covering the cutting point and the areas between particles. This coating prevents any direct contact of dirt or metal particles, which are thrown out by centrifugal force.

Sprayed on the abrasive surface, or in some cases on the work piece, the liquid requires a grit one size finer than the normal abrasive for the application.

Degreasing is done with soap and water.

"Myers Miracle," Myers & Ellis, Inc., 10 South LaSalle Street, Chicago 3, Illinois.

Use postpaid card. Circle No. 85

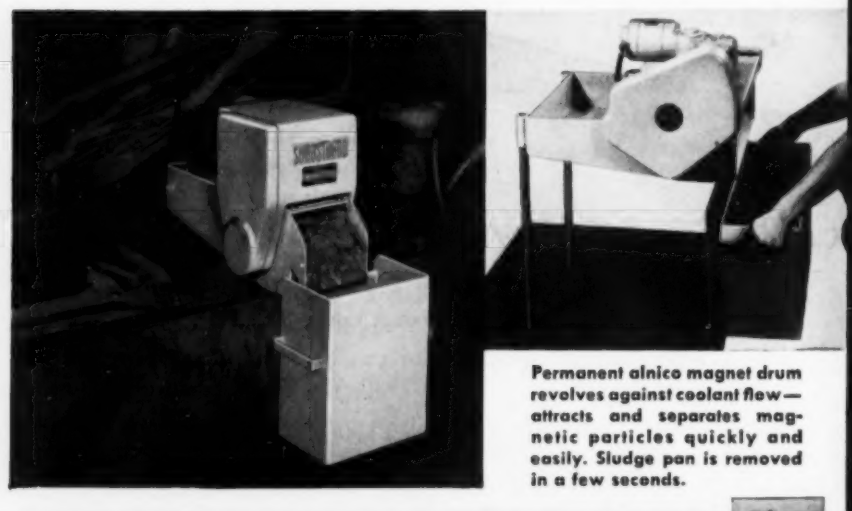
In no time at all, you can install a Sundstrand coolant separator

. . . to lengthen wheel life, improve finishes, reduce downtime, eliminate sump cleaning, and the number of coolant changes.

Installation is easy, separator can be placed right on open coolant tanks in most machines — no repiping or fitting necessary.

Maintenance is quick and easy. Separated material is deposited into a sludge pan which can easily be removed for cleaning in a few seconds, without any tools. No more sumps to be cleaned out.

You will save money and improve the quality of your grinding, honing, and gear shaving operations with Sundstrand magnetic coolant separators. They're available in four capacities: 25, 50, 75, and 100 gpm.



Permanent alnico magnet drum revolves against coolant flow — attracts and separates magnetic particles quickly and easily. Sludge pan is removed in a few seconds.

Bulletin A368 gives complete data. Write for your copy today.

MARK OF RELY-ABILITY

SUNDSTRAND POWER GRIP

SUNDSTRAND-AMERICAN BROACH
ANN ARBOR, MICHIGAN
Division of SUNDSTRAND CORPORATION

Use postpaid card. Circle No. 231

ABRASIVE CUTTING MACHINE HAS OSCILLATING ACTION

A dry oscillating speed-cut abrasive cutting machine is the newest addition to the Speed-Cut line of abrasive cutting equipment manufactured by the Abrasive Machine Division of Beaver Pipe Tools, Inc.

The oscillating feature of the new unit provides greater cutting capacity. It will cut up to 4" solids and most 6" shapes.

A 20 hp motor provides power to cut at a rate of three to four seconds per square inch. The unit is available with an air-operated power head which increases wheel life and provides complete uniformity of cut.

Abrasive Machine Division, Beaver Pipe Tools, Inc., Warren, O.

Use postpaid card. Circle No. 86

PISTOL GRIP HANDLE ALLOWS ACCURATE 1-HAND CONTROL

An offset pistol grip handle is featured in the 31V and 31S series of Buckeye grinders and sanders. The handle permits accurate one-hand control over general duty finishing operations.

Buckeye Tools Corp., 5005 Springboro Pike, Dayton 1, Ohio.

Use postpaid card. Circle No. 87

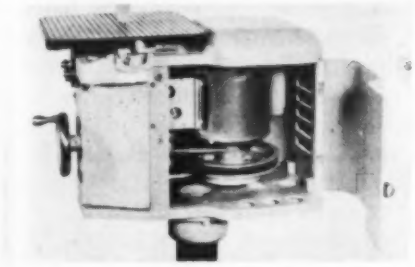
PORTABLE COOLANT PUMP REQUIRES NO PLUMBING

No plumbing or special mounting requirements are necessary to operate "Mr. Cool," a portable coolant pump which is usable on one or on two machines at a time. Any available container can serve as a reservoir. The pump is 24" tall and weighs 22.5 pounds.

M-M-A, Inc., Lancaster, Pa.

Use postpaid card. Circle No. 88

ANNOUNCE NEW LINE OF RICE PROFILE GRINDERS



Rice Pump and Machine Company's redeveloped line of profile grinders extends the range of precision grinding to include the grinding of die clearances, cams, and contours, plus a wide variety of finish-grinding work.

The new features include a hinged access door to facilitate interior maintenance and a larger serrated table (12" x 13½") with an improved U-bracket support with a 4-way tilt.

Spindle speeds are available in 20,000, 30,000, and 35,000 rpm ranges for the single speed machines and in 20,000-30,000 and 20,000-35,000 rpm for two-speed units. These grinders are basically the bench type, but may be mounted on a pedestal or four-legged floor stand provided by the manufacturer. Bulletin PG-1-38 describes the new line.

Rice Pump and Machine Co., Belgium, Mass.

Use postpaid card. Circle No. 89

CHECKS PART TRUENESS TO MINUS 10 MILLIONTHS

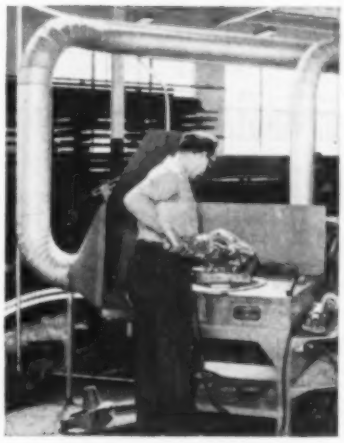
The new model Roto-Grind checks trueness of parts to less than 10 millionths and runout and concentricity to less than 20 millionths.

It can be set up in a vertical or horizontal position. A variable control motor lets the operator work with both hands free. Equally spaced indexing of 2, 3, 4, 6, 8, 12, or 24 combinations are obtainable. Wear is controlled to maintain a true running table.

M-M Tool and Manufacturing Co., 1124 East Third Street, Dayton 2, Ohio.

Use postpaid card. Circle No. 90

AIR IN MOTION KEEPS MEN IN MOTION



K & B system serving castings grinding removes dust, sand and chips as fast as they are produced. Work revolves on turntable to enable operator to work continuously.

Dusty or fume-laden air can curtail production and increase maintenance costs by dulling worker efficiency and damaging bearings, motors . . . even machines.

Efficient K & B Dust Control Systems put AIR in Motion to become an important production tool.

In the plant of a noted chain and forging firm, an official made this comment about a new K & B installation: "Our workmen can now work full time . . . this means added production for them and for the company as well."

Call on K & B engineers to put *AIR in Motion* and help boost your plant efficiency. The Kirk & Blum Manufacturing Company, 3124 Forrer Street, Cincinnati 9, Ohio

50 YEARS OF SERVICE

KIRK & BLUM

DUST CONTROL

K & B Down Draft Dust Control System in plant of The Monarch Machine Tool Co., Sidney, Ohio

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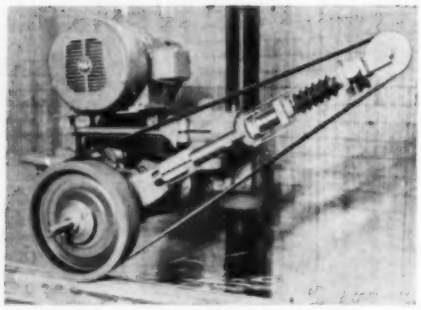
ABRASIVE BELT ATTACHMENT INCREASES FINISHING RANGE



An abrasive belt arm attachment that can be easily installed on adjustable buffing lathes of various makes provides an economical means of adding abrasive belt polishing operations to existing equipment and to increase flexibility of production finishing operations.

The lightweight attachment is mounted on the spindle housing o buffing lathes. Various standar belt arm attachments will handl belts 2" to 8" wide and 96" to 132 long. The attachments can also b arranged to adapt other specific bel lengths.

Acme Mfg. Co., 1400 E. Nine Mil Road, Detroit 20, Mich.

Use postpaid card. Circle No. 91

ELECTROLYTIC GRINDING SPINDLES

Pope Machinery Corporation now has available a large number and variety of precision motorized, belt-driven spindles arranged for electrolytic grinding at amperages from 50 up to 3,000. Insulation is built-in and the spindles are equipped with a new fork-type brush assembly for cool operation.

Pope Machinery Corporation, 261 River Street, Haverhill, Mass.

Use postpaid card. Circle No. 92

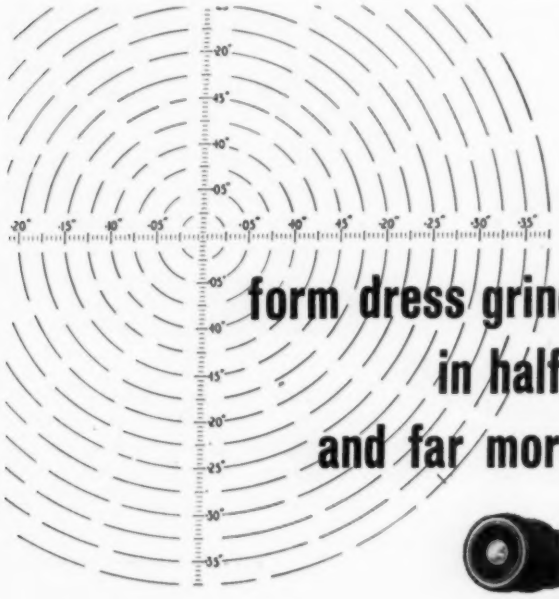
COMPACT SAND BLASTER STENCILS AUTOMATICALLY

Visual observation of the workpiece is not necessary to the operation of a new, compact sand blast machine which automatically stencils and marks metals, glass, and plastic components.

The machine, Model 173, is made by Pressure Blast Mfg. Co. It is a re-designed version of Model 162.

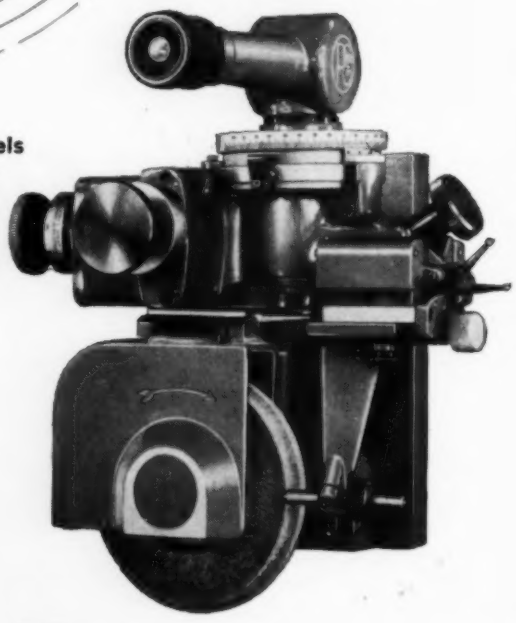
In Model 173, parts to be etched are placed in a work-locating fixture on the top of the cabinet. The sand blast nozzle is located in the cabinet and is fixed in a vertical position. A foot pedal controls the abrasive flow.

Two, three, or four nozzles can be used in other versions of Model 173. The masking job determines the number of nozzles. One can handle stencil work up to ¼" round or



NOW—

form dress grinding wheels in half the time— and far more precisely!



New OPTIDRESS forms wheels under optical control, permanently mounts to surface grinders and tool and cutter grinders.

Dress in one continuous motion a radius and two tangent angles.

Intricate profiles formed without templates, production speeded on limited runs.

Microscope-controlled diamond assures accurate settings, perfect blending from radius to tangent and inspection of dressed wheel.

Permanently attached to the machine—always ready for specials—machine set-up not required between grinding and re-dressing.

Write today for detailed information on OPTIDRESS and other new Parker-Hartford optical equipment that will simplify form grinding on your present machine.

THE PARKER-HARTFORD CORP.

OPTICAL DIVISION

650 Franklin Avenue, Hartford, Conn.

Use postpaid card. Circle No. 233

⅛" square. More are used if larger areas are to be marked.

The cabinet is 37" wide x 19" deep x 31" high. It is made of heavy gage welded steel. Provision is made for ducting to the rear.

Pressure Blast Manufacturing Co., 27 Pleasant Street, Manchester, Connecticut.

Use postpaid card. Circle No. 93

DIAL INDICATOR HOUSINGS

A series of indicator housings to provide maximum protection to dial indicators are first items in the new line of standard gaging components developed by AA Industries, Inc.

Two sizes of these precision aluminum die-cast guards are available for through-type and 90-deg. dial indicators 2¼" or less in diameter.

AA Industries, Inc., 350 Fair Street, Ferndale 20, Mich.

Use postpaid card. Circle No. 94

POSITIONING MACHINE HAS MOTOR-DRIVEN TURNTABLE

The Model PM-1051 positioning machine provides a motor driven turntable on which weldmounts and other assemblies may be mounted for precision positioning and rotation during welding or fabrication operations.

Assemblies up to 2,000 pounds in weight can be mounted on the 32" diameter flat-machined faceplate and secured to milled T slots. Preselected angular positions of the table from vertical to 15° beyond the horizontal are automatic through adjustment of a control protractor and a touch of a push button to energize the drive motor.

Right or left hand table rotation is also push-button operated and accomplished by a worm and gear drive mounted in roller bearings and running in oil. A control knob permits selection of speed up to 4 rpm.

Boesch Mfg. Co., Danbury, Conn.

Use postpaid card. Circle No. 95

OLSON FILTRATION ENGINEERS *Cincinnati 12, Ohio*

OL-17-G

Send complete information on the new Olson "package" coolant filter.

*Name*_____

*Firm Name*_____

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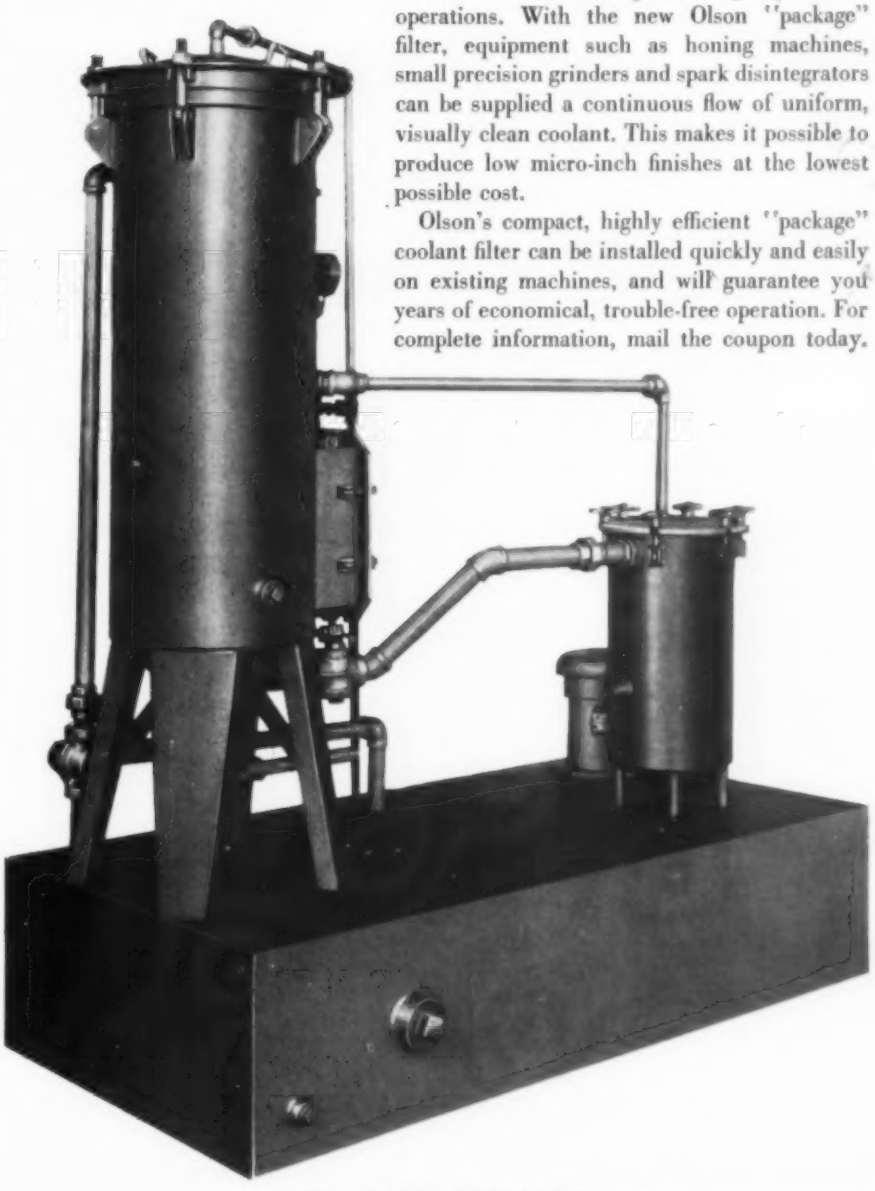
*City*_____ *Zone*____ *State*_____

Only from Olson . . .

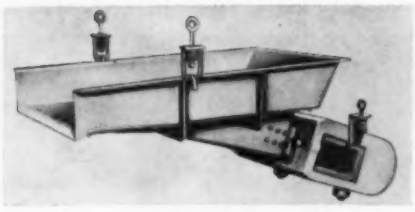
"PACKAGE" COOLANT FILTERS FOR INDIVIDUAL MACHINES

Now you can lower your cost-per-part even on individual machines performing specialized operations. With the new Olson "package" filter, equipment such as honing machines, small precision grinders and spark disintegrators can be supplied a continuous flow of uniform, visually clean coolant. This makes it possible to produce low micro-inch finishes at the lowest possible cost.

Olson's compact, highly efficient "package" coolant filter can be installed quickly and easily on existing machines, and will guarantee you years of economical, trouble-free operation. For complete information, mail the coupon today.



Use postpaid card. Circle No. 232



ADD MIDDLE-SIZED HEAVY-DUTY FEEDER

A third in a new series of new heavy-duty vibratory feeders, the FH-45, is rated at 350 tons per hour, and will be used as an intermediate feeder between the company's present models F-45 (200 tons per hour) and F-55 (500 tons per hour).

The rated capacity of 350 tons per hour is based on handling damp sand or coarser materials weighing 100 lbs per cubic foot, in a standard 42" x 60" flat pan trough sloped 6° downgrade.

Capacities will differ with various materials. A stepless control of feed rate can be adjusted from maximum capacity down to 10% of maximum capacity. The FH-45 is furnished complete with separate controller for 230 or 460 volt, 60 cycle, single phase, a-c operation.

The other models in this new series are the FH-22 rated at 40 tons per hour and the FH-33 with maximum capacity of 75 tons per hour.

These feeders are furnished complete with separate controllers for 115, 230 or 460 volt, 60 cycle, single phase, a-c operation.

Syntron Company, 1253 Lexington Avenue, Homer City, Pennsylvania.

Use postpaid card. Circle No. 96

BLASTING GRIT REQUIRES NO SPECIAL EQUIPMENT

Black Beauty Blast Grit requires no special equipment, is re-usable, and is impervious to moisture. It produces a minimum quantity of dust and is devoid of the silicosis health hazard. Currently it is in use by the Armed Forces.

A free sample kit is available for for selection of proper grain size. After grade has been determined, advise the minimum quantity necessary and shipment will be made for a production trial run via prepaid cartage on a "no-charge" basis.

H. B. Reed & Co., Inc., 6937 Kennedy Avenue, Hammond, Inc., or H. B. Reed Corp., 91 Passaic Street, Passaic, N.J.

Use postpaid card. Circle No. 97

AIR ACTUATOR FOR HOLLOW SPINDLE MACHINES

The new Wil-Numat air actuator for use on all hollow spindle machines can be used to actuate either push or pull collets, expanding mandrels, rubber-flex collets, or power chucks. It can be installed on almost any machine without machine modifications.

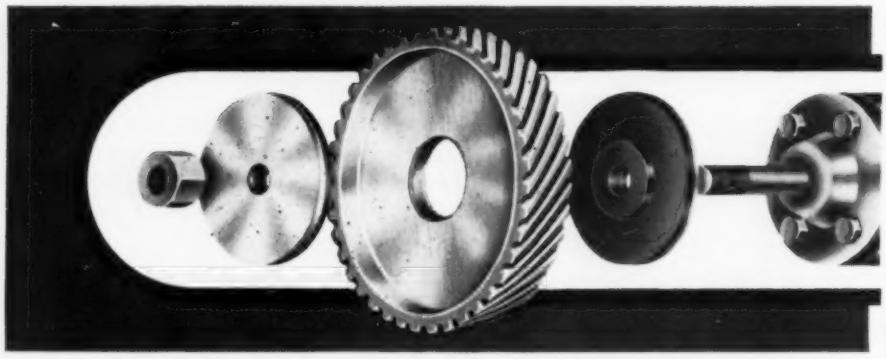
The Wil-Numat collet closer converts automatics or turret lathes to chuckers or a chucker to a bar machine. Use of the hole through the spindle is retained for feeding coolant to work, feeding bar stock, or reaching back of the workpiece.

The actuators operate off the shop air supply, multiplying gripping power at the jaws up to 80 times line pressure. Closing and opening of collets are instantaneous.

Wil-Numat Corp., 411 South Hindry, Inglewood 1, Calif.

Use postpaid card. Circle No. 98

NEW! SELF ALIGNING LOW COST



Cosmo Contact Wheels WITH
COSMO-ALIGNER FLANGES

- ELIMINATES VIBRATION
- QUICK INSTALLATION
- FITS ALL WORN SHAFTS
- INCREASES PRODUCTION
- MOST ECONOMICAL

Your present equipment will operate like new with these self-aligning, low cost, Cosmo-Aligner shaft flanges. They operate with smooth perfect balance on all types of worn shafts. Made of durable rubber cushions, vulcanized to the face of ⅛-inch steel discs. Eliminating vibration will increase the life of your belts and bearings, as well as produce a finer finish for your end product. Call or write today for further information.

R-100 AVAILABLE WHEEL SIZES
Width of Face

Dia.	Flange	1"	1½"	2"	2½"	3"	3½"	4"
6"								
7"								
8"	SHADED AREA INDICATES							
10"	SIZES AVAILABLE							
12"								
14"								
16"								

*Flanges should be ordered with set of wheels.

RECOMMENDED USES FOR R-100 COSMO WHEELS

SIZES, DUROS and SERRATIONS TO MEET EVERY GRINDING and FINISHING NEED

R-100-PF — Soft duros for fine finishing in flat work or mild contour work.

R-100-STD — 1 to 1 land to groove ratio. General purpose wheel used in all duros.

R-100-SCOOP — 1 to 2 land to groove ratio. Provides faster cutting and more aggressive stock removal.

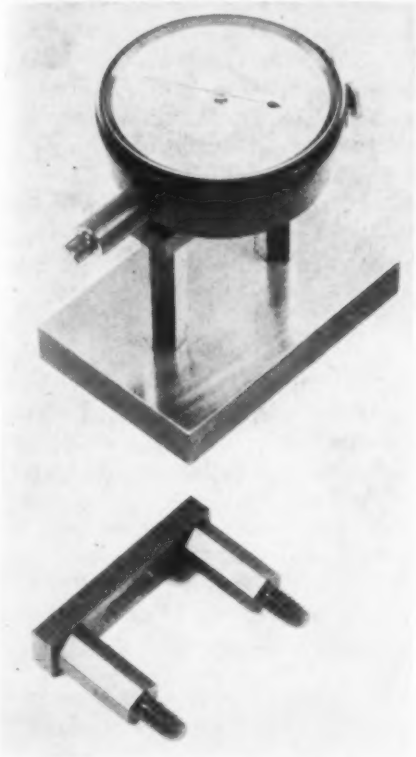
R-100-59 — 1 to 2 land to groove ratio. Deeper serrations, increased flexibility, conforms best to unusual contours.

R-100-E — This is a slotted expanding wheel for bands only.

MANUFACTURED BY CHICAGO RUBBER CO., INC. FOR
Cosmo-Wheels, Inc. 1019 FULTON STREET CHICAGO 7, ILLINOIS

Use postpaid card. Circle No. 235

DIAL INDICATOR MOUNTING ATTACHES TO ANY FIXTURE



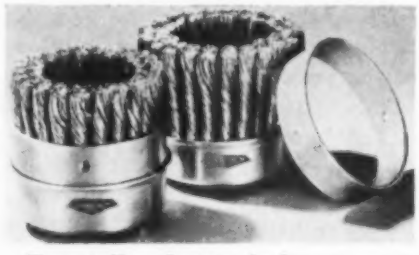
Only two drilled and tapped holes are needed for attaching a new adjustable dial indicator mounting to any fixture.

The mounting makes it possible to use an adjustable bracket back indicator mounting at a cost comparable to that of a regular indicator back.

Unigage Corporation, 330 Interstate Road, Addison, Ill.

Use postpaid card. Circle No. 99

BRUSHES DESIGNED FOR USE ON HIGHSPEED TOOLS



Especially designed for use on highspeed air and electric tools, a new line of KEB wire brushes, equipped with removable bridles, compress the brush face for a greater cut and reduce flare.

The brushes are filled with special anaylsis Osborn steel wire to withstand severe usage on work which needs heavy-duty metal-cleaning tools in the range of medium to large surfaces.

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.

Use postpaid card. Circle No. 101

HYDRAULIC MAINTENANCE SETS FOR BASIC PULLING JOBS

Three new hydraulic maintenance sets will remove and install gears, bearings, bearing cups, sheaves, shafts, couplings, sprockets, pulleys, wheels, and other similar pieces.

Owatonna Tool Co., 522 Cedar Street, Owatonna, Minn.

Use postpaid card. Circle No. 102

NEW BENCH CLAMP

Rapid mounting and change of bench location of the Tilt-Swivel Vise is possible with a new bench clamp that bolts to the vice. The new clamp provides faster, easier set-up for such operations as precision filing, drilling, grinding, or finishing.

Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.

Use postpaid card. Circle No. 103

BACK-FLUSHING CARTRIDGE FILTER IS AUTOMATIC

A combination separator and automatic back-flushing cartridge filter, for use during gun drilling, honing, and lapping operations, will filter to five microns in capacities of 20 to 55 gpm.

The dirty coolant enters the separator and by retarded movement through overflow weirs, most of the solids are separated before the liquid is pumped through the cartridges for filtering.

By time clock and electronic control, one cartridge is back-flushed using the filtered liquid from the other cartridges. Cartridges are backflushed in sequence to maintain the desired flow rate.

Henry Mfg. Co., Inc., 519 E. Reed St., Bowling Green, Ohio.

Use postpaid card. Circle No. 104

Marvel ABRASIVES

RESIN BONDED DISCS
1. Marvel Discs are available in all diameters and grit sizes. Either Aluminum Oxide or Silicon Carbide grain. Used on all metal-working operations.

CUP WHEELS
2. Marvel Cup Wheels are reinforced with Fibre Glass. Cost less and last longer, thereby reducing your grinding costs.

ECONOMY WHEELS
3. This wheel supersedes the depressed Center or Raised Hub wheel. No adapters required. Cuts faster and lasts longer. Available in 7"-8"-9" diameters x 1/8"-3/16"-1/4" thickness. All have 5/8"-11 threaded hub.

FLEXIBLE CLOTH WHEELS
4. Available in all popular grit sizes, widths and diameters. Resin Bond for severe operations. Glue Bond for Satin finish and polished finishes.

SHEETS
5. These sheets come in 9 x 11 and other popular sizes. Made with Aluminum Oxide, Silicon Carbide and Garnet Grain on paper or cloth backings.

ROLLS AND BELTS
6. Available in all grit sizes and widths on paper or cloth backings—glue or Resin Bond.

Marvel RESIN-BONDED COATED ABRASIVES

BATES ABRASIVE PRODUCTS
1129 EAST 74th STREET
CHICAGO 19, ILLINOIS

Use postpaid card. Circle No. 236

NEW DIAMOND TOOL FOR WHEEL DRESSING

A new wheel dressing diamond tool features 150 select quality octahedrons set in tungsten powders for tough gripping action around the stones. The face of the tool measures ¼" x ⅝" and is 7/16" deep.

There are alternate layers of 21 and 22 diamonds set in the face, and these act similarly to more than 20 needles cleaning the metal particles from the wheel. The tool is perfect for dressing wheels from 12" to 48" in diameter. It is guaranteed to outwear a 2-carat diamond wheel dresser and is for use on both dry or wet grinding machines.

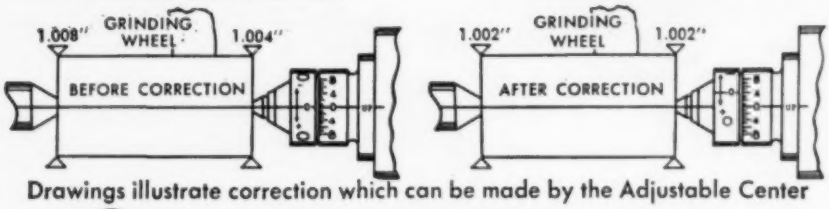
Lazzara Co., 112 Meyerland Plaza, Houston 35, Texas.

Use postpaid card. Circle No. 105

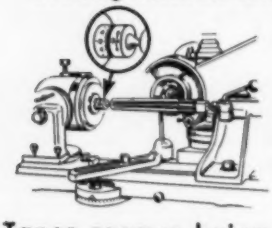
NEW ... *fast, easy* CENTER ALIGNMENT *for* GRINDERS

Center being used on grinder

The Enco Micro-Set® Adjustable Center



Drawings illustrate correction which can be made by the Adjustable Center



Taper reamer being ground

- Permits TRUE work alignment from tailstock or headstock on: cylindrical grinders, cutter grinders, gear shavers, lathes and tracer attachments.
- Saves one half the setup time.
- Ends hit or miss table adjustments to obtain precise alignment.
- An inexperienced operator can get a precise alignment—easily—in seconds.
- Quickly pays for itself in time and scrap savings.

MORSE TAPER
No. 2—$49.50, No. 3—$61.50, No. 4—$76.00.

BROWN & SHARPE
No. 6, 7—$53.00, No. 8, 9—$65.00, No. 10, 11—$85.00.

JARNO
No. 6, 7—$53.00, No. 8, 9—$65.00, No. 10, 11, 12—$85.00.

STRAIGHT SHANK
¾"—$56.00, 1"—$68.00, 1¼", 1½"—$80.00.

Helical milling cutter being reground

Enco MANUFACTURING CO.

We also manufacture Precision Lathe Turrets and Tiny-Titan Magnet Base Holders.

Dept. 841, 4520 W. Fullerton Ave., Chicago 39, Ill.

Write for catalog and nearest distributor.

SEE US AT BOOTH 3834 ASTME SHOW, NEW YORK COLISEUM

Use postpaid card. Circle No. 237

CENTERING GAGE ACCURATE TO 2½ MILLIONTHS

The accuracy of the Trans-O-Limit Centering gage, including linearity and repeatability is 1% of full scale equal to ¼ of one division on the scale. The resulting accuracy in the high magnification range is 2½ millionths.

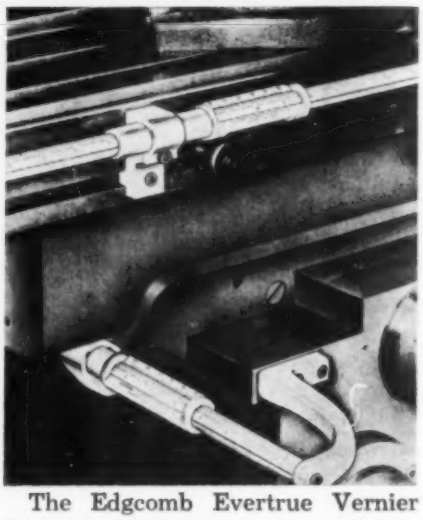
Adjustable, the gage has a radial capacity of 23" I.D., 19" O.D., and a depth capacity of 8⅜" to 15⅛" depending on the configuration of the part.

Principle uses of the gage are: accurate positioning and aligning of work on machine table; checking for spindle run-out; measuring holes, plugs, and bosses for taper, squareness, bellmouth, concentricity, and center-to-center distances.

Pratt and Whitney Company, Inc., West Hartford, Conn.

Use postpaid card. Circle No. 106

VERNIER SCALE ATTACHMENT ACCURATE WITHIN ±.0002



The Edgcomb Evertrue Vernier Scale attachment, used in positioning and relocating points, is accurate within ±.0002.

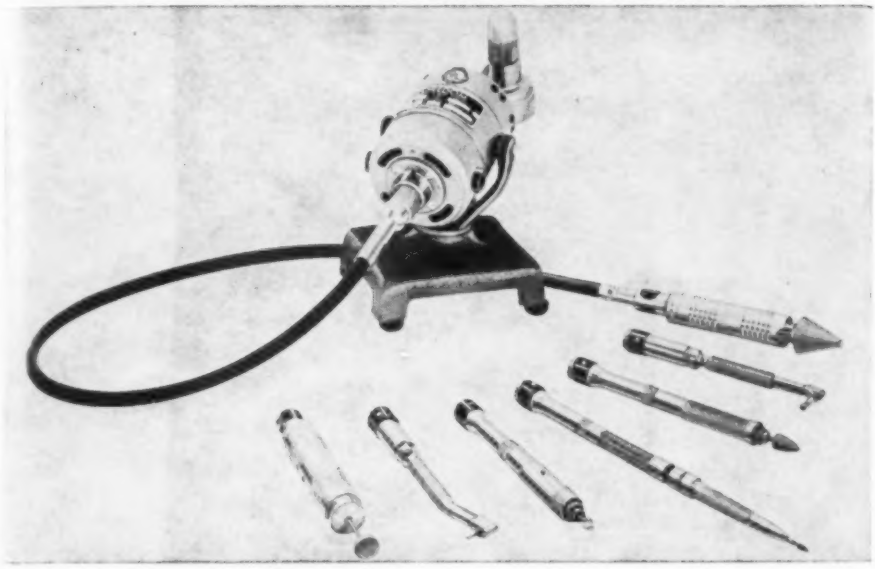
The new scale helps hold close tolerances on older machines by providing the means for overcoming errors caused by backlash and worn lead screws. The unit eliminates the need for measuring hole centers and compensates for machine setting errors.

It is available for table lengths from one to fifteen feet and is adaptable for one, two, or three axis operation. The complete set consists of longitudinal and crossfeed scales with verniers and necessary mounting brackets. Prices start at $220.

Edgcomb Engineer and Engraving Co., 1105 North Hollywood Way, Burbank, Calif.

Use postpaid card. Circle No. 107

FOREDOM ADDS MINIATURE FLEXIBLE SHAFT MACHINE



Foredom Electric Company has added a handy bench-type flexible shaft machine to its line of miniature power tools.

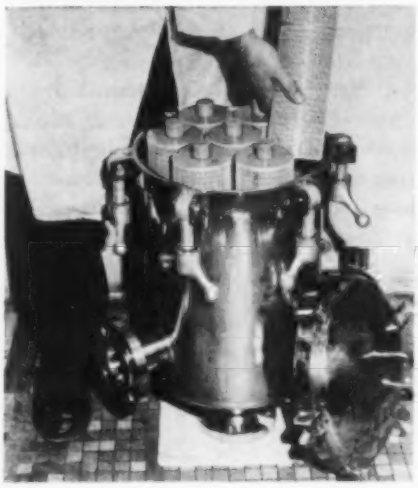
"GG" is easily portable, weighing less than 9 lbs. complete. It may be used on materials ranging from metals to glass and is valuable for grinding, drilling, polishing, deburring, marking, etc.

The slimness and variety of handpieces permit use on all types of intricate and delicate jobs in difficult places. The lightness of the handpiece allows singlehand operation.

Foredom Electric Company, Inc., Bethel, Conn.

Use postpaid card. Circle No. 109

FILTERS ALL PARTICLES LARGER THAN 3 MICRONS



Hydraulic and other petroleum-based fluids and water can be filtered to absolute 3-micron cleanliness with the Triphaner filter assembly at rates up to 170 gpm continuous flow. No recirculation or preliminary filtration is required.

The unit, originally developed for use in processing bulk MIL-H-5606 hydraulic oil before packaging, features extremely high dirt capacity.

Heart of the unit is a combination fiberglass membrane primary throwaway cartridge. The fiberglass provides fine filtration. The membrane removes all particles larger than 3 microns

Housings are made of stainless steel and are rated at 125 psi. The design is flexible enough to allow for other flow rates and pressures.

Aircraft Porous Media, Inc., Pall Corporation, 30 Sea Cliff Avenue, Glen Cove, N.Y.

Use postpaid card. Circle No. 108

DIAL TABLE—built to fit your exact requirements.
#55 HEAD—compact, rugged, multi-position polishing and buffing head. Operates right or left.
VERSATILE "PRODUCTION-PROVEN" FINISHING EQUIPMENT
from MURRAY-WAY
INDEXING CONVEYOR—incorporates exclusive Murray-Way indexing or continuous features.
EDGE GRINDER—for precision grinding of products such as floor tile.

Murray-Way offers a complete line of standardized, economical finishing equipment for both large and small shops. In addition, experienced Murray-Way production engineers, working with the finest manufacturing facilities available, will gladly help with your specialized production problems.

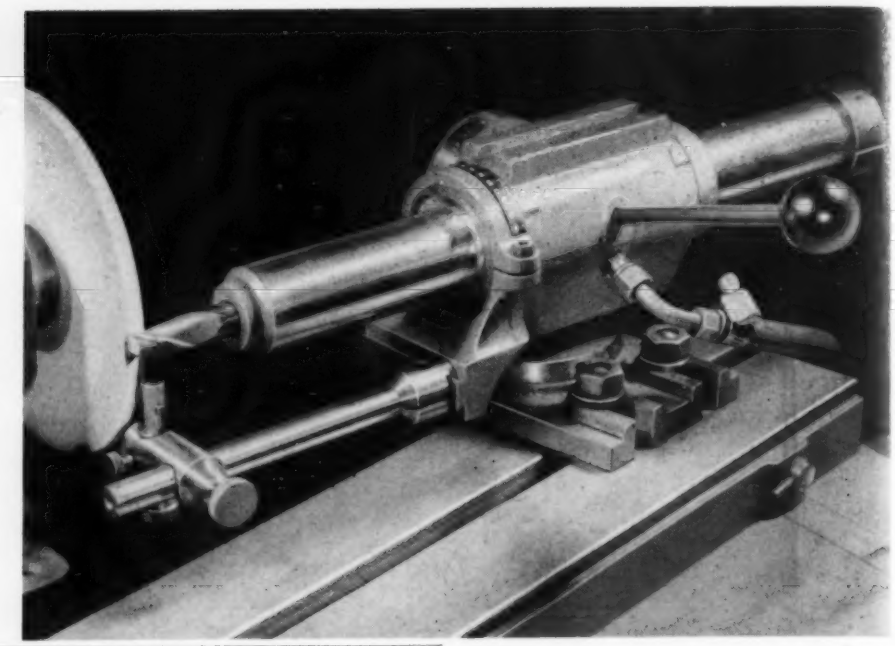
Write for detailed literature.

MURRAY WAY

MURRAY-WAY CORPORATION

P. O. BOX 180 • MAPLE RD. EAST
BIRMINGHAM, MICH.

Use postpaid card. Circle No. 238



SHARPENING FIXTURE FEATURES FLOATING SPINDLE

The Harig AIR-FLOW sharpening fixture features a sensitive jerk-free spindle which floats on less than a .00015 film of air.

The super-sensitive air bearing speeds sharpening of end mills, routers, and almost all types of milling cutters.

The flow of air inhibits the entrance of grinding dust and facilitates the sharpening of tools with shank capacities from 1/32" to 1¼". Milling cutter sharpening range is thru 6" diameter. Any style, including side mills and stagger teeth, may be sharpened.

Other features of the unit are a finely-graduated goose-neck tilt, a graduated swivel base, fine blade-rest adjustment, hard chromium inlay, and indexes and components to grind-tapered and straight end-mills.

Harig Manufacturing Corp., 5757 West Howard Street, Chicago 31, Ill.

Use postpaid card. Circle No. 110

MAGNETIC BASED LAMPS

Recarr, Inc., of Chicago, has introduced its new line of magnetic based lamps for use in the machine tool field. They are available in two styles—one for wide area illumination and another for concentrated light in a localized area.

Recarr, Inc., 126 North Clinton Street, Chicago 61, Ill.

Use postpaid card. Circle No. 111

MINIATURE BORESCOPE

Complete inspection of very small bores is possible with a borescope available from Welch Allyn, Inc. A shaft length of 4 11/16" and a diameter of .145" permit the scope to be used in situations where no other method of inspection is possible.

Right angle observation is provided through a lens system of high optical efficiency which produces a magnified image that is clear, corrected, and sharply defined. Power is supplied from a battery handle or transformer.

Welch Allyn, Inc., 155 Jordan Road, Skaneateles Falls, N.Y.

Use postpaid card. Circle No. 112

Recent help-wanted advertisement appearing in Minneapolis Morning Tribune.

TOOL ROOM
JIG GRINDER
ON NEW MOORE JIG GRINDER
NITES—TOP PAY & OVERTIME
American Mach. & Tool Co.
205 NORTH 3RD ST. FE 9-7241
TOOL & MOLD MAKER

Why this plant can afford top pay and overtime on its Moore Jig Grinder

This versatile precision machine has been *a night-and-day* moneymaker throughout the twenty-odd years since Moore pioneered the principle of Jig Grinding. Ask any Moore owner! Ask Carl A. Berg, for example, who ran the above advertisement for his new No. 3 Moore Jig Grinder in a Minneapolis newspaper recently.

That's because Jig Grinding is the happy answer to the ever-present problem of accurately locating and grinding holes, contours and surfaces to size in hardened steel and carbides. The No. 3 now holds tolerances to *less than a tenth!* See positioning accuracies under photo of the machine at right.

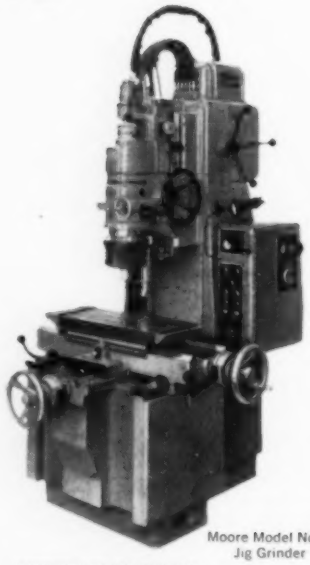
Mating parts such as punches and dies can be finished concurrently and made to figures by Jig Grinding with the Moore, rather than just "to fit." Service life is greatly increased, because fits are more accurate, alignment is assured and surface finish is improved.

The flexibility and accuracy that make it a "must" for toolroom applications also make the No. 3 Jig Grinder a key machine in model, experimental, precision machining, and development work. Here, prototype and critical parts are quickly produced to the closest tolerances required.

When users offer top pay and overtime to operators of this busy machine, *they do so because it earns that kind of return* ...for toolroom, production, experimental laboratory and inspection assignments.

May we prove it to you?

MOORE SPECIAL TOOL COMPANY, INC.
725 Union Avenue, Bridgeport 7, Conn.



Moore Model No. 3 Jig Grinder

ACCURACY OF POSITIONING

LONGITUDINAL TRAVEL:	
Greatest error in any inch	30 millionths
Greatest error in 18 inches	90 millionths
CROSS TRAVEL:	
Greatest error in any inch	30 millionths
Greatest error in 11 inches	90 millionths
SQUARENESS:	
Compound slide	60 millionths
Travel, spindle housing	90 millionths in 13"
Travel, spindle	90 millionths in 3⅛"

HOLES, CONTOURS AND SURFACES. Moore's authoritative book of 423 pages, 495 illustrations on tool, die and precision parts production, includes these fine chapters: "Jig Grinding Principles and Applications," "Jig Grinding Holes," and "Jig Grinding Contours." $5 in U.S.A., $6 elsewhere.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTOGRAPH WHEEL DRESSERS • PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES

Use postpaid card. Circle No. 239

HOW NORTON COMPANY CONTROLS ITS ABRASIVE DUST

Norton Company's daily routine in its production of abrasive products provides a full range of dust control problems—moisture, high temperatures, highly abrasive characteristics, and heavy dust loads.

Norton's dust problem is big. Its Worcester, Mass., plants alone require 141 dust collectors. These exhaust 1.5 million cfm of air to control more than 70 tons of dust daily.

The dust naturally consists mainly of abrasive materials. This characteristic makes complete dust control essential to health as well as a means of preventing equipment damage.

For Norton's newest facility—a straight-line production organic bonded grinding wheel plant—dust control equipment designed and manufactured by the Pangborn Corp., of Hagerstown, Md., has been installed.

Six "Self-Cleaning" collectors in the wheel finishing section collect nine tons of dust daily. Each collector has more than 3,000 sq. ft. of cloth area and exhausts 12,000 cfm a day.

After baking in ovens, abrasive wheels are "finished"—machined with parallel sides, true outer diameters, true center openings; then babbit bushings are inserted in some. The wheels are speed-tested, inspected, packaged, and shipped. The dust created by these operations—mostly silicon carbide and aluminum oxide—are exhausted to the six "Self-Cleaning" collectors.

Even the collection of dust from cleaners is dust-controlled at Norton Company. Here, a worker fits a portable dust hood around the discharge tube to trap stray particles during the dust removal operation.

The system of discharging collected dust is also carefully planned. Hopper bottom connections match the special hoppers used for disposal. Special hoods and flexible piping provide control of the dust during unloading of the hoppers.

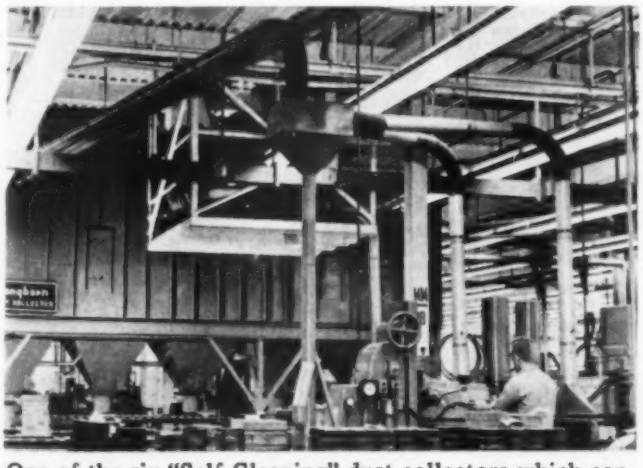
The cloth in the collectors is cleaned continuously and automatically. There is no need to shut down the system, and high collection efficiency is constant.

The results of this dust control system have been termed "very gratifying." The air has been kept clean despite the tons of dust produced daily, and maintenance costs have been low—less than $300 on all six collectors in the first year of operation.

The pressure drop for Norton's system is figured for each dust source and carefully balanced. The result is that every dust producing machine has sufficient suction.

The nine tons of finishing dust collected daily from Norton's new plant is salvaged. It is not used again for the manufacture of grinding

continued



One of the six "Self-Cleaning" dust collectors which control some nine tons of dust a day at the Norton Company.

Here is one of the wheel "truing" operations which produce a portion of the dust collected by the cleaners.

wheels, but it has other valuable uses. Other dust collectors at Norton serve crushing mills, screening operations, and many abrasive grain processing, grinding wheel manufacturing, and material handling operations.

Norton has its own staff of dust control engineers, headed by William J. Samborski, supervisor of construction and service. This staff devotes a great deal of time to Norton's dust control problems.

By now, they have solved the problem by efficient collection and proper design of the control system. The purity of the air in Norton plants is well above all recognized government and insurance company standards for dust in the air.

A by-product, of course, is the excellent reputation Norton enjoys as a member of the Worcester industrial community.

UNION TWIST DRILL TAKES OVER THREAD DIE COMPANY

The Union Twist Drill Co., Athol, Mass., is to acquire the entire business and assets of the Reed Rolled Thread Die Co., of Holden, Mass. The Reed business will be operated as a wholly owned subsidiary under its present management with no personnel or operational changes.

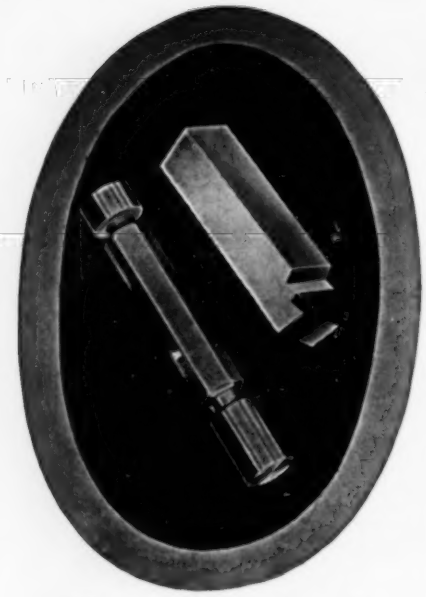
SKF INDUSTRIES BUYS NICE BALL BEARING COMPANY

The assets of Nice Ball Bearing Co., of Philadelphia, Pa., a division of the Channing Corp., have been acquired by SKF Industries, Inc.

Nice employs about 800 persons and has plants located in Philadelphia and Lansdale, Pa.

REQUEST RESERVATIONS FOR "DIA-MO-RAMA"

The A. I. T. Diamond Tool Co. has announced that large attendance in its "Dia-Mo-Rama" room during recent months makes it necessary for A. I. T. to ask those companies who have not yet attended to request reservations at least 30 days in advance.



For increased output and accuracy, finish your tools and gages with HYPREZ DIAMOND COMPOUNDS

Virgin Diamond particles, graded in our own laboratories, are uniformly dispersed in the exclusive Hyprez vehicle for maximum cutting action. They produce finer results faster on every finishing job... Your nearby Hyprez distributor will help you solve any lapping or polishing problem that may arise.

Write for free demonstration or technical bulletin No. HG-41

HYPREZ DIVISION
ENGIS EQUIPMENT CO.
431 S. Dearborn St., Chicago 5, Illinois

Use postpaid card. Circle No. 241

Fortune
TUMBLING MEDIA
for Deburring and Finishing

Preforms in over 300 shapes, sizes and bonds for all barrel and vibratory operations.

- Finest bonding materials
- No "roll-over" of burrs
- Minimum media fracture
- Maximum production

Free lab service reports proper media for your parts.

Write today for our Tumbling Media File.

Fortune Industries, Inc.
31770 DEXTER RD. CHELSEA, MICH
Phone GR 9-3621

Use postpaid card. Circle No. 242

WALLS TU-WAY BELT SANDER

Full 1/3 h.p. G. E. Motor

USE IT EITHER WAY

At last, a top quality industrial sander that provides all the most wanted features — yet sells for so little.

complete with cord, plug, switch ready to use $89.95

Illustrated Literature on Request
A few desirable distributor territories still available.

WALLS SALES CORPORATION
59-63 Van Dam St. Brooklyn 22, N. Y.

Use postpaid card. Circle No. 243

GENERAL AMERICAN ACQUIRES INFILCO, INC.

T. M. Thompson, president of General American Transportation Corp., of Chicago, and J. S. Gustafson, president of Infilco, Inc., of Tucson, Ariz., announced January 24 that the Chicago corporation has acquired the outstanding stock of Infilco.

Present plans are for the Tucson firm, a leader in the field of water and waste equipment design and manufacturing, to continue to operate under its present management.

FINISHING PROCESS STOPS STEREO TAPE HEAD SMEAR

The Taft-Peirce Mfg. Co. has developed a super-finishing process which uses preshaped microstones to finish magnetic stereophonic tape heads. The process eliminates amorphous smear on the heads.

The heads are held in a special chuck on the face plate of a lathe and are rocked manually while the microstones oscillate against the surface in which the contact points of the heads are imbedded.

Only 5 to 10 seconds of microstoning are required to bring the heads to the specified finish of six micro-inches or less.

ROCKWELL MANUFACTURING ACQUIRES PORTER-CABLE

An agreement by Rockwell Mfg. Co., of Pittsburgh, Pa., to acquire the assets of the Porter-Cable Machine Co. was completed in December. The agreement provides for the acquisition of the assets on the basis of seven shares of Rockwell Stock for every ten shares of Porter-Cable.

Porter-Cable will operate as a wholly-owned subsidiary of Rockwell. The company is one of the nation's leading portable electric power tool manufacturers. Rockwell operates 22 plants in the United States and three in foreign countries. It has more than 6,500 employees and 14,000 stockholders.

GEORGE SCHERR, TUBULAR MICROMETER MERGED

The integration of Tubular Micrometer Company (Tumico) of St. James, Minn., with George Scherr Co., of New York City, has been completed through acquisition by the St. James firm of all outstanding Scherr stock in exchange for 100,000 shares of Tumico common stock. The corporate name has been changed to Scherr-Tumico, Inc., with headquarters in St. James.

GRIND PROFITS UP!

Use U. S. Electrical Tools

Profits do *go up* when you use U. S. Electrical Tools. You get easier, faster, more economical grinding, buffing and polishing operation. U. S. Electrical portable tools are profit-makers, too. Ask your nearest distributor.

The United States Electrical Tool Co.
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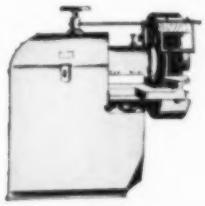
Precision Lathe Grinder



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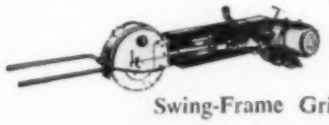

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The sale of uncut gem diamonds reached a new high in 1960, according to an announcement by De Beers Consolidated Mines, Ltd.

Gem diamond sales for the year ending December 31, 1960 amounted to $177,662,601. In 1959, gem diamond sales totaled $176,492,924 and were higher than in any previous year.

Industrial diamond sales for 1960 amounted to $73,498,471. The total sales of industrial diamonds in 1960 were exceeded only by sales for 1959 when $78,687,717 worth of industrial stones were sold by the African mines.

The total sales of gem and industrial diamonds amounted to $251,-161,072 in 1960 as compared with $255,180,641 in 1959.

Sales of industrials were depressed in 1960 by the reduced demand from American industry, chief consumer of the world's supply of industrial diamonds.

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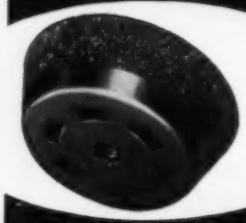

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William Johnson, of R-O Manufacturing Co., explains form relief grinding methods while the actual job is demonstrated on an R-O fixture and grinder setup.

The fundamentals of form-relief grinding methods and the advantages of their use in tool sharpening and shape forming were comprehensively demonstrated at a "Form-Relief Workshop Conference" held in Cleveland, Ohio, in December.

The conference was presented by R-O Manufacturing Co. It was held at the Cleveland Engineering Society and was the first of a planned series to be presented in major industrial centers across the country.

Grinding and production specialists were given special invitations to attend. The discussions and demonstrations were conducted by William Johnson and Ray Nixon of R-O.

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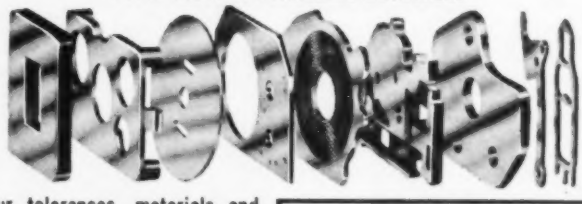

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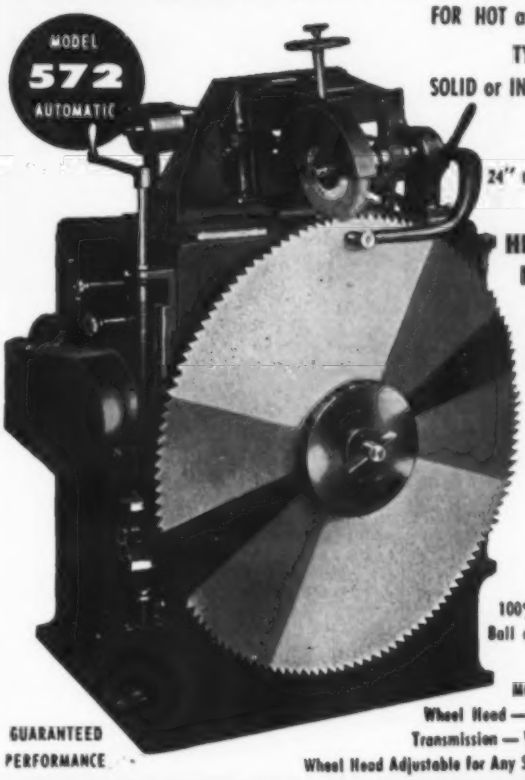

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Grinding and Finishing

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Coming Next Month

Standard Wheel Marking System: Wheel Structure

Fourth of a series. Structure, or grain spacing, indicated by a number, is a measure of comparative density. It provides chip clearance.

Testing Portable Grinding Wheels

Accurate comparisons of portable grinding wheels are difficult because of all the variables involved. This article describes one major company's test apparatus and procedures.

Diamond Dressing Study Favors Custom Tools

Diamond dressing tools matched to the wheels on which they are used show advantages over all-purpose tools.

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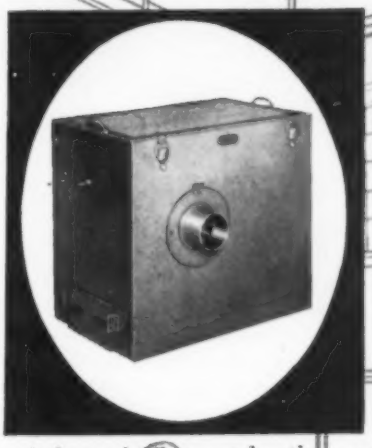
designed to collect dust from single machines



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Is the U.S. Losing the Race?

Anyone interested in America's economic future looks with horror on the implications of the January shipments of the American machine tool builders. These implications are shocking. How does anyone having his country's welfare at heart sleep soundly at night? And it makes no difference whether one manufactures machine tools, autos, bolts, grinding wheels, stoves, or toys.

Shipments of all types of metal cutting machine tools totaled $35.5 million. Of these $14.5 million were foreign shipments, or a whopping 41%. The balance, or $21 million, were domestic shipments. The implications which worry us lie in the ratio of foreign to domestic shipments. To be sure, the builders are thankful for the foreign business, for without them their plight would be catastrophic.

Why are foreign industries, especially European automotive, plunking down hard cash for American machine tools? Primarily because the European machine tool industry, producing to capacity, cannot meet the demand. (By contrast, our own machine tool industry is below 50% of capacity.) The significant point is this: foreign industries are expanding and modernizing so rapidly that their own machine tool industry cannot meet the programs of their industries. And when we reflect that West Germany alone has over 500 machine tool builders, (the U.S. has 376) and add to this the builders of Great Britain, France, Italy, Belgium, Switzerland, Japan and the Soviet bloc, we are staggered by the foreign machine tool industry, producing to capacity, raising the industrial facilities of the western world to monumental heights. Compare this to the snails-pace program of the U.S., building little brown mole hills!

With the exception of the U.S., all industrial nations are arming for an assault on world markets, including our own domestic market.

With the exception of the U.S., all industrial nations are modernizing their facilities, replacing their equipment so that the world's needs for products of every kind and description will be satisfied. Not satisfied with American goods! No, the goods of other, better equipped, nations!

The U.S. is not modernizing at the rate it should, is not replacing obsolete clunkers, is not reinvesting in productive equipment and facilities. The climate, tax-wise, for modernization and capital expenditures has not only been poor, it's been criminal.* Thus we see foreign customers buying our machine tools, in addition to their own, to increase productivity; at the same time we run around, spread gloom, complain, and let the old clunkers rattle around for another five years.

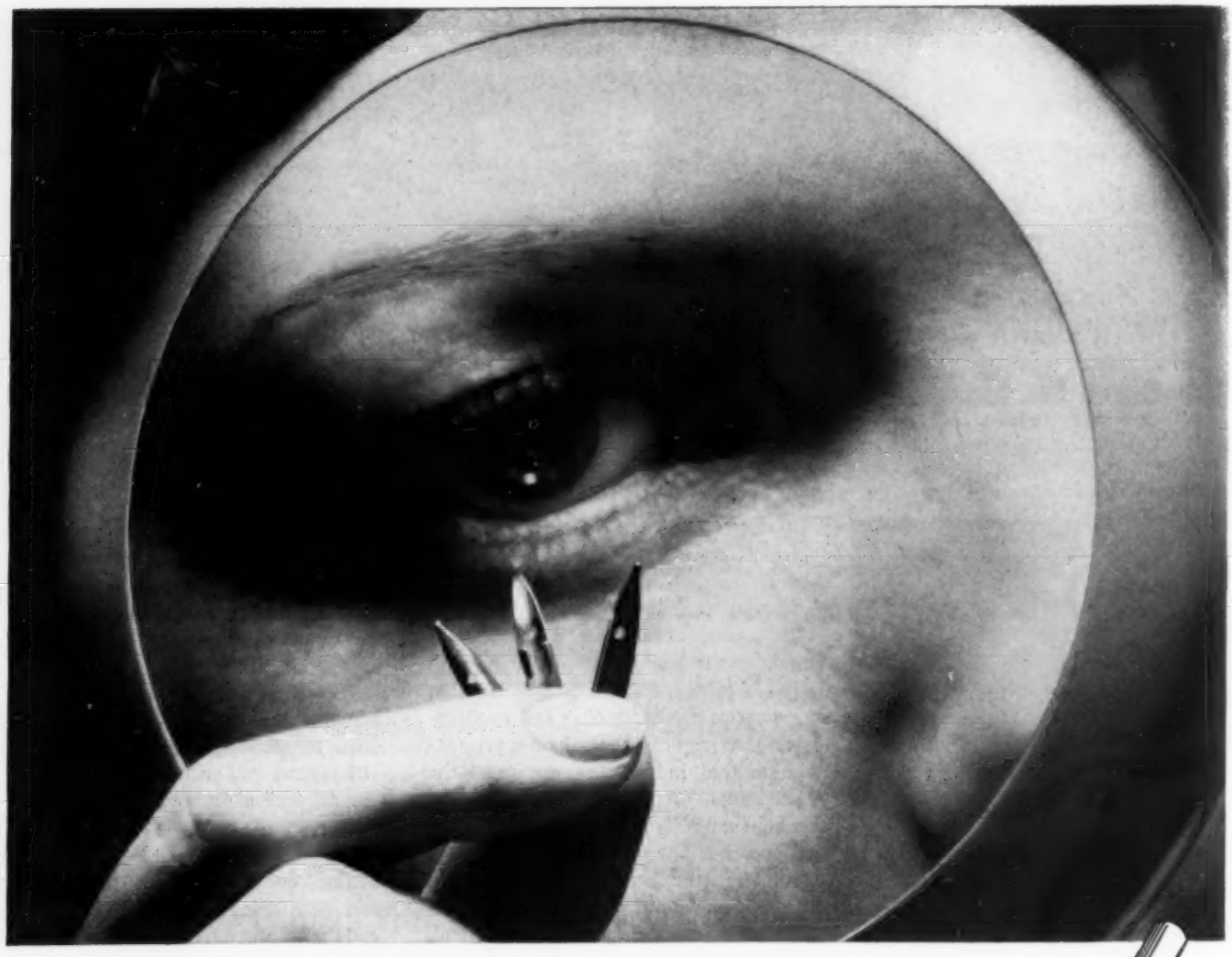
The goods and products which foreign nations will produce economically with our tools will haunt us. The import picture (and we have no fight with importers, believing, as we do, in free trade) will be black for American business and for the American worker. We will never compete in world markets, or our own domestic markets, with foreign producers who operate efficiently in modern plants; and who pay lower wages.

The U.S. must replace, must modernize, must grow up industrially and take advantage of new techniques, it must forge its weapons in a healthy fiscal and a sound depreciation climate. This is as urgent as finding a bucket for bailing out a water-filled boat.

*We are encouraged by President Kennedy's awareness of this problem and by his desire to do something about it. Report of this is on page 29 of this issue.

Wm. F. Schleicher

Vice President & Editorial Director



ALMCO Precision Finishing Gets to the Point.

At the Parker Pen plant in Janesville, Wisconsin, nibs for the famous Parker Pen are carefully examined (as shown). The writing surface must be flawlessly deburred and polished before being attached to the pen barrel in final assembly.

Almco precision finishing equipment does the job quickly and efficiently! Both conventional units and the new Vibratory machines are used at Parker to help make fountain pens that resist pressure, friction and abuse.

Almco's modern machines and methods—the Supersheen System—can help you achieve fine finishing results too. At Almco you receive trained counsel for your finishing problems . . . free sample processing in Almco's modern labs . . . skilled guidance in selecting the proper standard or custom-designed Almco machines and methods. Write today on your letterhead asking for an Almco sales engineer to call. Or send parts direct to Almco's lab with specs required.

Parker Pen barrels are Almco precision finished too! Almco Vibratory units can do the work 100 times faster than conventional finishing machines.

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New brochures now ready on Almco spindle machine, Vibrasheen, other cost saving units. Price list on Almco compounds and media included. Send for your Almco Album of New Products today!

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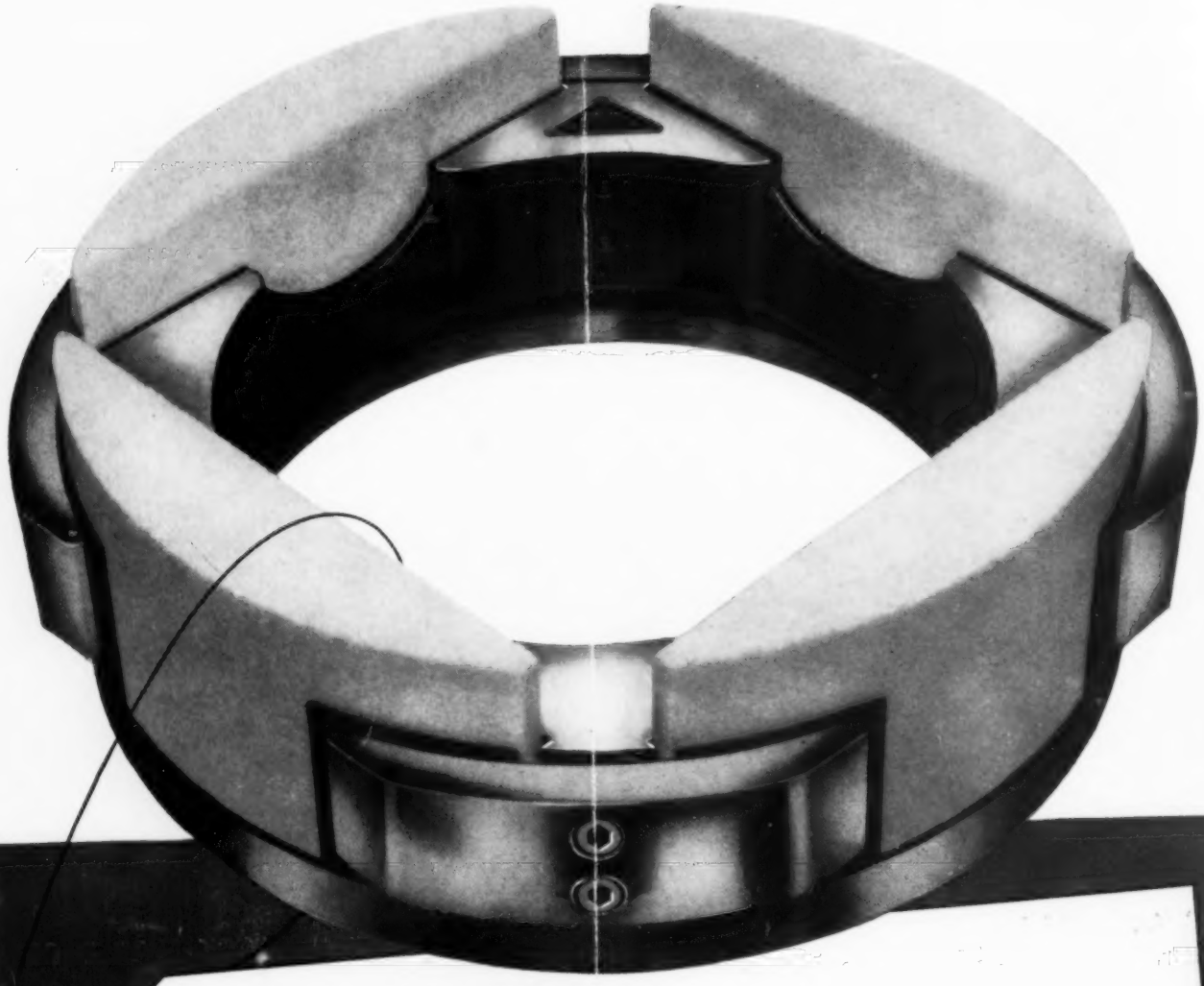

TEST REPORT

TO: Purchasing Department

FROM: H. J. King FOREMAN, Grinding DEPT.

MATERIALS TESTED: Cortland Segmental Chuck + Segments

FINDINGS: Removes stock rapidly with less segment wear. Gave required finish, well within tolerance. Segments can be changed quickly. Light weight will reduce wear on spindle bearings.

RECOMMENDATION: Purchase for production.

CORTLAND GRINDING WHEELS CORPORATION CORTLAND

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